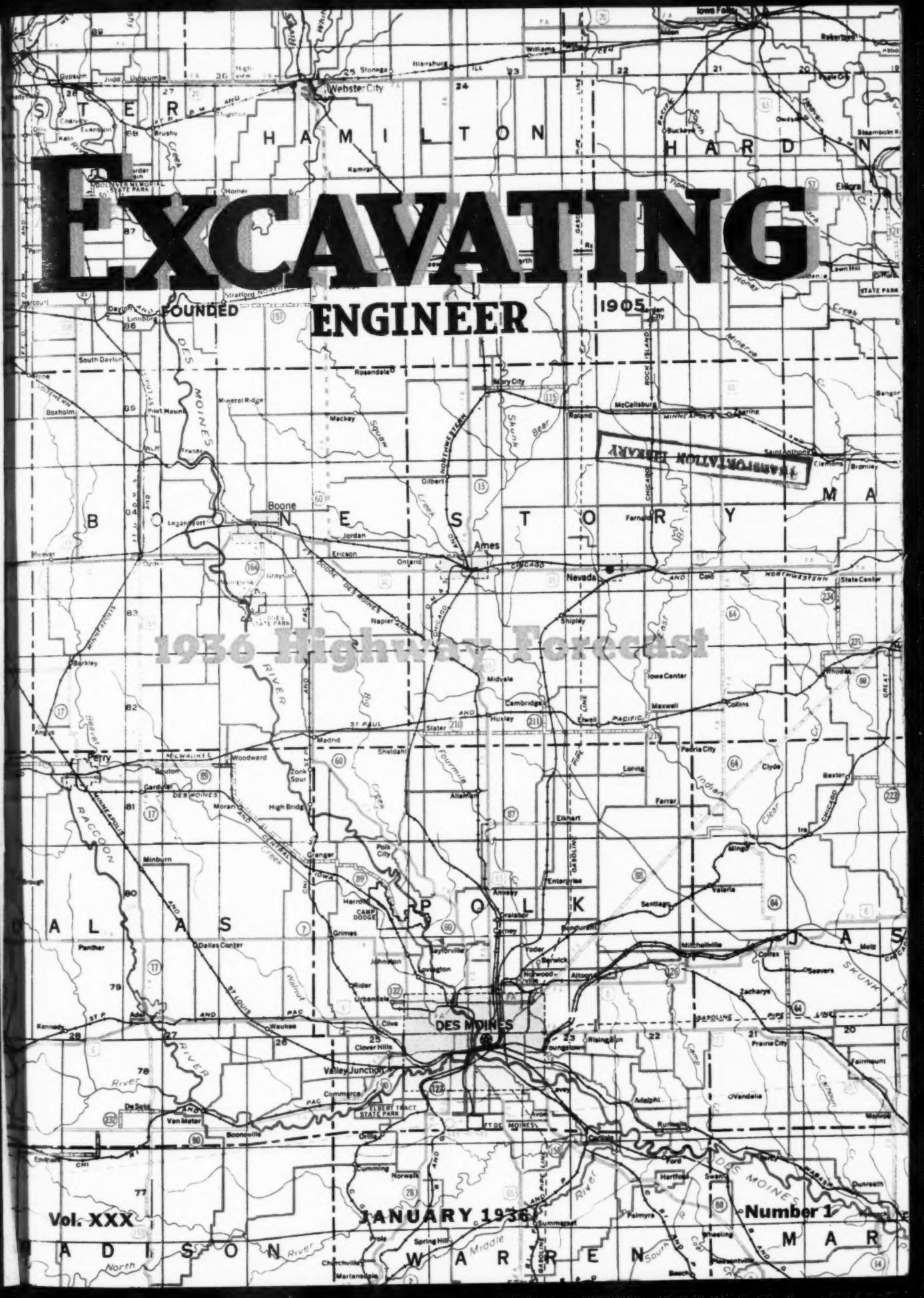
EXCAVATING
ENGINEER
FOUNDED 1905
1936 Highway Forecast
DES MOINES
Vol. XXX
JANUARY 1936
Number 1

YOU CAN GET THE SHOW-DOWN EVERYWHERE

Working day and night, this "Caterpillar" Diesel Tractor cuts the costs and speeds up the work of building a dam near Beach City, Ohio.

Wherever there's dirt to be moved—or any one of a hundred other jobs to be done—there's where you'll learn the "Caterpillar" SHOW-DOWN. You'll see "Caterpillar" Tractors, the 9-to-1 preference on the country's biggest construction jobs. You'll hear talk of the new records for low costs that are being made by "Caterpillar" Diesels. And you'll get the rest of the SHOW-DOWN—the proof of low maintenance costs—from owners who have run their "Caterpillar" Diesels 6000, 8000 hours and more. See your dealer for details of this modern power. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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GROUND that has become wet and yielding is still substantial footing for the Bucyrus-Monighan Walking Dragline. Its broad-area walking shoes do not permit slipping or "digging in". With its low center of gravity, the Walker doesn't need level footing; one side can settle down without disturbing the machine's ability to walk and work. This means more working days per year, more profit hours per day. Investigate the Walker! Manufactured by Bucyrus-Monighan Company, Chicago, Ill.

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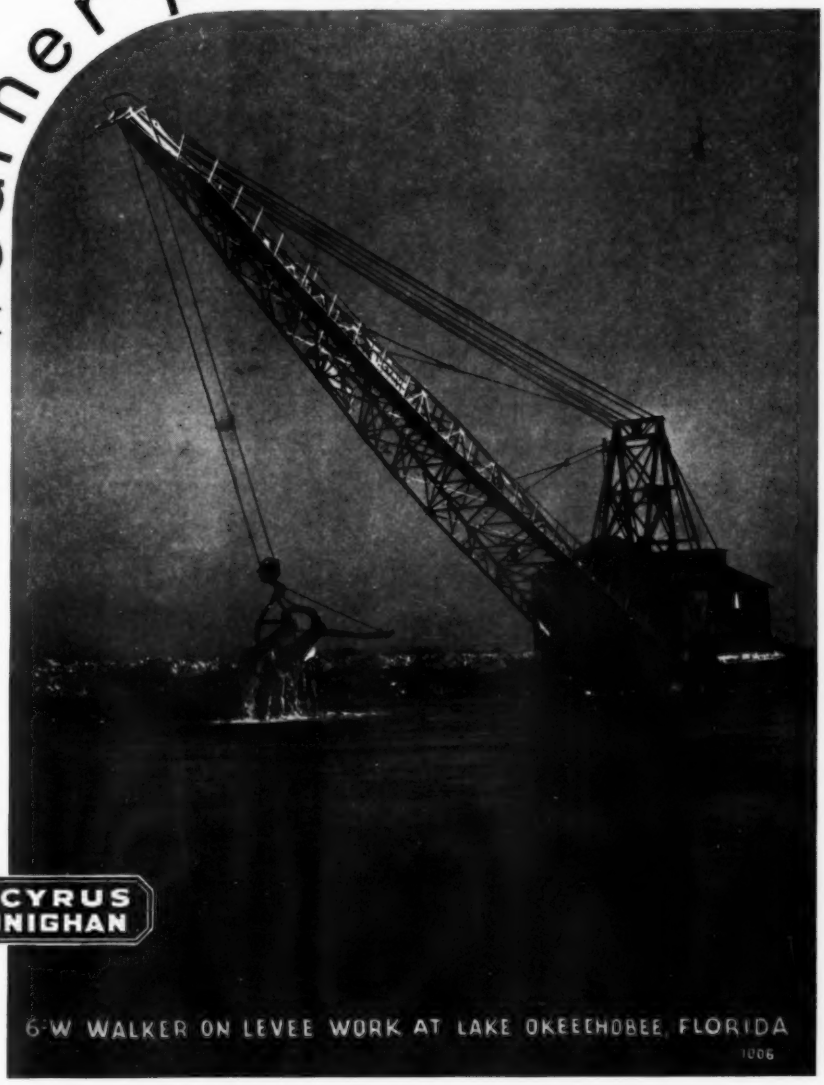

6-W WALKER ON LEVEE WORK AT LAKE OKEECHOBEE, FLORIDA

1006

BUCYRUS MONIGHAN

Sold by

BUCYRUS-ERIE

EXCAVATING, DRILLING, AND MATERIAL-HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN

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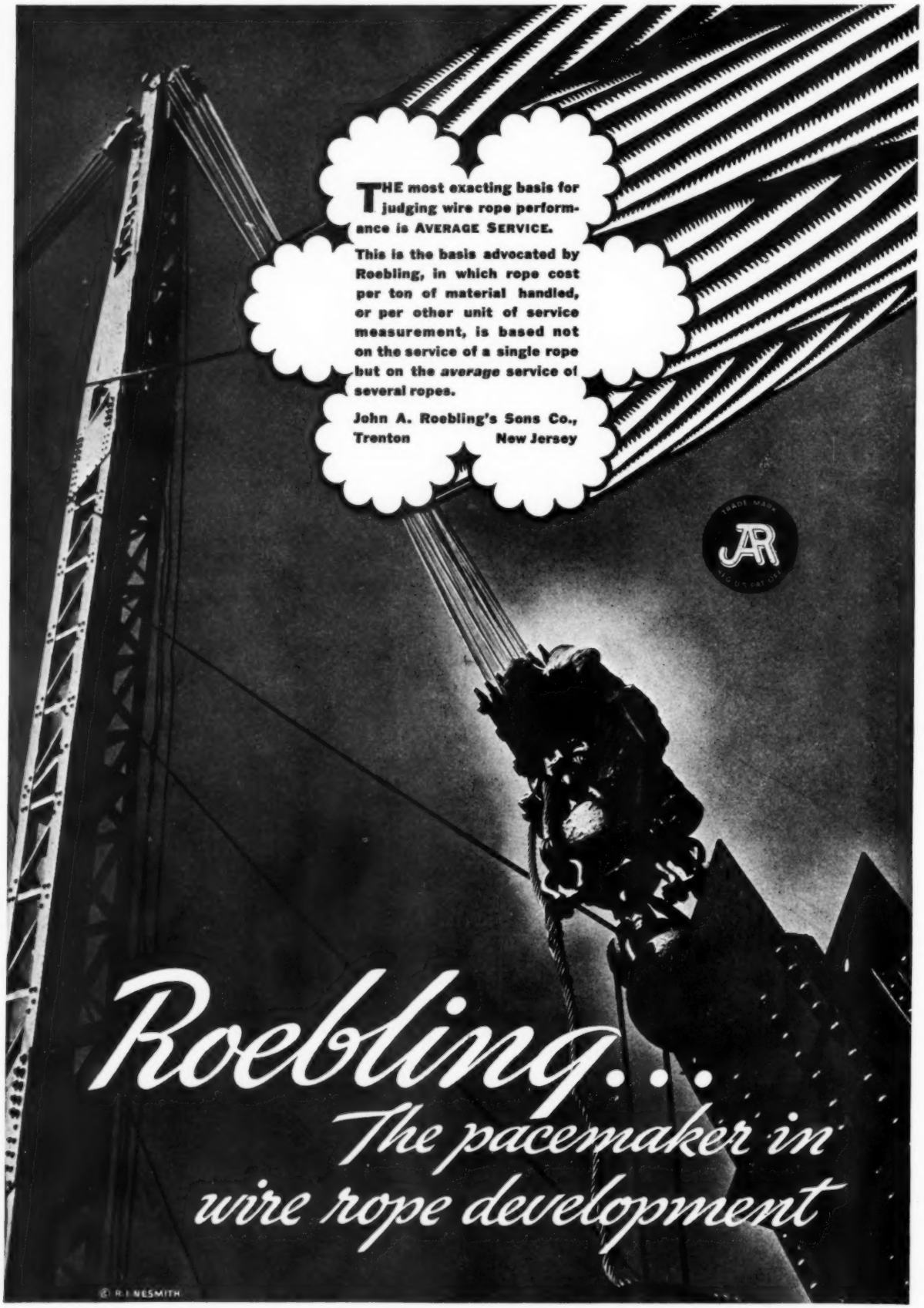
THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.
This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.
John A. Roebling's Sons Co., Trenton New Jersey
TRADE MARK
JAR
Roebling...
The pacemaker in wire rope development
© R. I. NESMITH

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FOUNDED IN 1905

EXCAVATING ENGINEER

DEVOTED EXCLUSIVELY
TO EXCAVATION

About Excavating Projects — By Excavating Men — For Excavating Men — The World Over

Vol. 30 **JANUARY, 1936** **No. 1**

Contents

Transportation Map of Iowa ..... **Front Cover**

The Bureau of Public Roads, in cooperation with the U. S. Geological Survey, has prepared a large-scale map showing location and character of practically all transportation arteries in the State of Iowa. See article page 31.

Not in the Contract **7**

Paver's Song, a Poem, by Charles Yohe **10**

Highway Forecast for 1936 ..... **11**

Highway construction expenditures to reach $875,000,000 this year . . . biggest year since 1931.

Alabama 13
Arizona 13
Arkansas 14
California 14
Colorado 15
Connecticut 15
Delaware 15
Florida 16
Georgia 16
Idaho 17
Illinois 17
Indiana 17
Iowa 17
Kansas 19
Kentucky 19
Louisiana 21
Maine 21
Maryland 21
Massachusetts 22
Michigan 22
Minnesota 22
Mississippi 22
Missouri 23
Montana 44
Nebraska 44
Nevada 46
New Hampshire 46
New Jersey 48
New Mexico 48
New York 48
North Carolina 48
North Dakota 50
Ohio 52
Oklahoma 52
Oregon 52
Pennsylvania 53
Rhode Island 53
South Carolina 53
South Dakota 53
Tennessee 54
Texas 56
Utah 57
Vermont 57
Virginia 58
Washington 58
West Virginia 59
Wisconsin 59
Wyoming 60

Reducing Costs at Cape Girardeau Quarry, by E. M. Gould **24**

This interesting article by the quarry superintendent summarizes experiences in quarry procedure which have led to lower-cost stone at the Cape Girardeau, Missouri, plant of the Marquette Cement Manufacturing Co.

Editorials **30**

Business Situation, The 30
Increasing Activity in the Construction Industry 30
What the Highway Forecasts Promise 31
Our Cover 31

Stretching Road Dollars in Wyoming, by James B. True **32**

State Highway Superintendent True tells how his department obtains maximum results from highway funds.

Equipment You Ought to Know About **34**

Allis-Chalmers Hauling Unit 34
Mack Traffic-Type Trucks 34
New Snow Plow and Blade Wing 34
Koehring Develops New Units 35
Oil-Resisting Air Hose 35
Independent Lighting Plant 35
Chain Belt Adds to Line 66
Diesel-Powered Roller 66
Cletrac Model "30" 66
Concrete Vibrators 66
Low-Priced Engine-Driven Arc Welder 67
Diamond T Line for 1936 67
Electric Generating Plants 67

Shots from the Firing Line **38**

Work Continues on National Parkway 38
High-Lights of the 1936 Road Show 38
First Concrete Poured at Grand Coulee Dam 38
St. Louis Scene of Aggregate Associations' Conventions This Month 39
Shovel Comes Through Fire Undamaged 39
Department of Commerce Establishes Unit for Business Research 39
National Paving Brick Association Holds Convention in January 42
Moving a Highway with Hose 42
Large Number of Awards Made by Bureau of Reclamation During December 42
Department of Commerce to Conduct Business Census 43
Public Lands for Sale 43

Trade Notes **64**

Book Reviews **64**

Looking Ahead

These interesting articles will appear in early issues of Excavating Engineer. Watch for them!

Traffic Maintained!

Pearson & Dickerson of Prescott, made five miles of Arizona mountain highway under handicap of working at high altitude without traffic detours.

Building Fort Peck Dam

Dredging operations for the earth fill core, diversion tunnel construction, and the excavation for the spillway will be presented in a series of articles starting in an early issue.

Published Monthly by **THE EXCAVATING ENGINEER PUBLISHING COMPANY, South Milwaukee, Wisconsin, U.S.A.**

F. O. WYSE
Managing Editor

ARNOLD ANDREWS
Editor

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E. T. OBENCHAIN
Assistant Editor

E. M. HEUSTON
Advertising Manager

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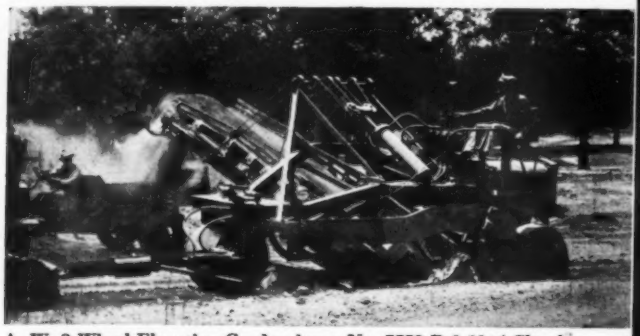
AUSTIN-WESTERN ROAD MACHINERY IS TWIN DISC EQUIPPED

Western No. 100 Crushing Plant, has a No. 7751 Power Take-Off Unit



A. W. 3-Wheel Elevating Grader, has a No. 7773-B-2-11½ Clutch

Austin Cadet Roll-A-Plane, has a No. 7773-B-2-11½ Clutch

Austin Bituminous Distributor, has a No. 7963 Power Take-Off Unit

No. 7963
Power Take-Off Unit

Ruggedness ... reliability ... reputation **are three main reasons why The Austin-Western Road Machinery Co. selects Twin Disc Clutches for their extensive line of road building machinery. It is significant that Twin Disc satisfies their many and varied requirements.**

It is equally significant that fully 95 per cent of *all* road building, material handling and construction machinery made in the United States is likewise Twin Disc equipped.

There is a broad line of Twin Disc Clutches and Power Take-Off Units from which machinery manufacturers may select the proper sizes and types that exactly suit their needs. *Write* for specific recommendations. Engineering data on request. *Twin Disc Clutch Company, 1335 Racine St., Racine, Wisconsin.*

VISIT BOOTH C-6A at the "OLD FASHIONED ROAD SHOW" Cleveland, January 20th to 24th

TWIN DISC CLUTCHES

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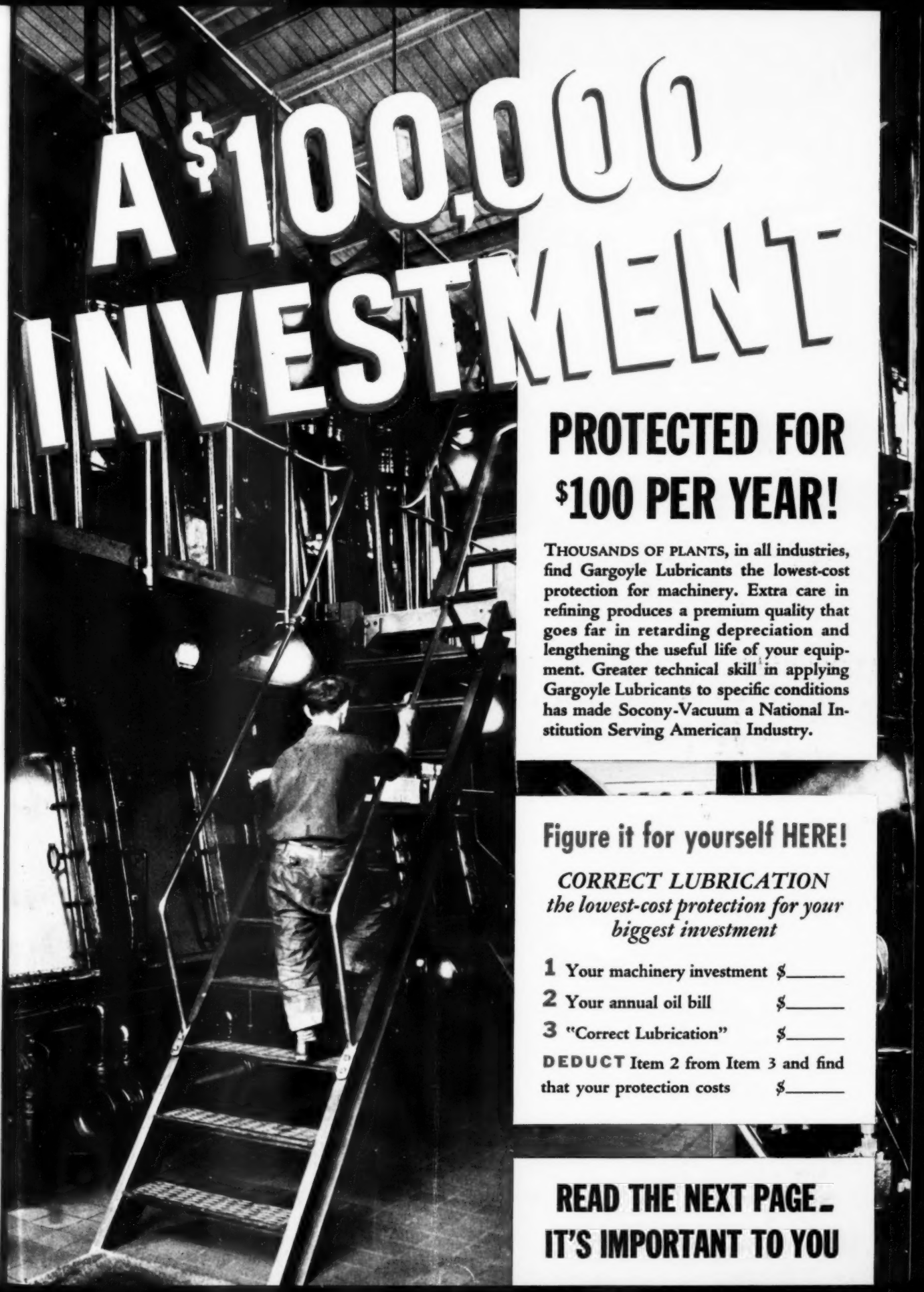

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THOUSANDS OF PLANTS, in all industries, find Gargoyle Lubricants the lowest-cost protection for machinery. Extra care in refining produces a premium quality that goes far in retarding depreciation and lengthening the useful life of your equipment. Greater technical skill in applying Gargoyle Lubricants to specific conditions has made Socony-Vacuum a National Institution Serving American Industry.

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1 Your machinery investment $_____

2 Your annual oil bill $_____

3 "Correct Lubrication" $_____

DEDUCT Item 2 from Item 3 and find that your protection costs $_____

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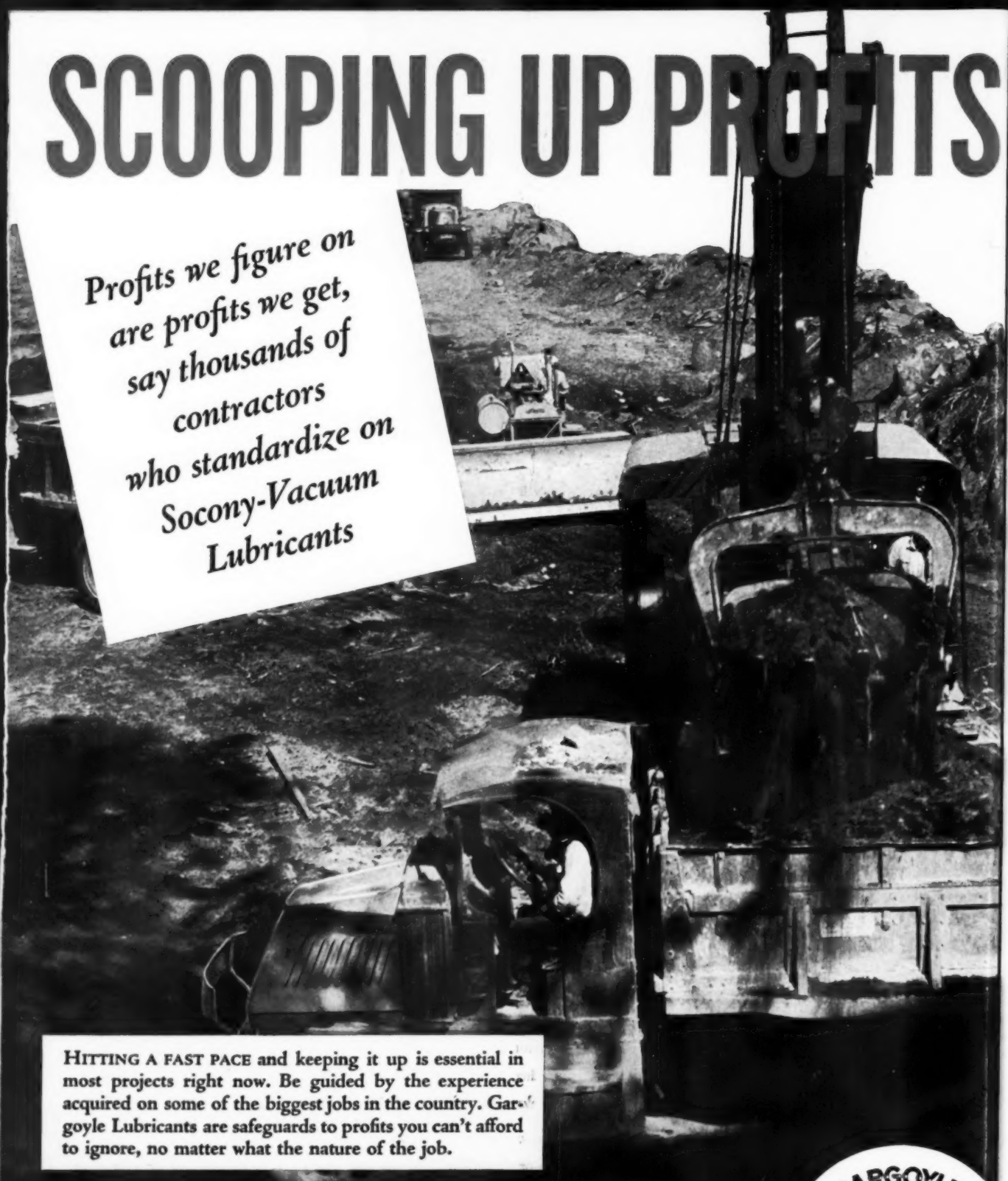
SCOOPING UP PROFITS



Profits we figure on are profits we get, say thousands of contractors who standardize on Socony-Vacuum Lubricants

HITTING A FAST PACE and keeping it up is essential in most projects right now. Be guided by the experience acquired on some of the biggest jobs in the country. Gargoyle Lubricants are safeguards to profits you can't afford to ignore, no matter what the nature of the job.

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WADHAMS OIL COMPANY · MAGNOLIA PETROLEUM COMPANY · GENERAL PETROLEUM CORPORATION OF CALIFORNIA

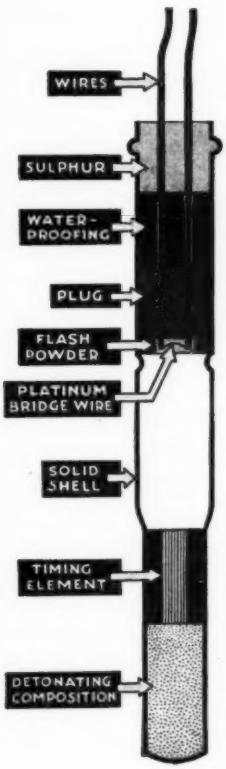
HERCULES' U. S. Patent No. 1,999,820 ★

means that something has happened

in "DELAYS"

NO VENT

HERCULES ALL-METAL DELAY
ELECTRIC BLASTING CAP



Just one look at a Hercules "No Vent" will tell you that something important has happened to "delays." **There isn't a vent or opening of any kind in the single, one-piece, all-metal shell.**

This revolutionary construction has been made possible by the startling discovery of a timing element that does not produce any gas.

Because the patented timing element does not produce gases of any kind, this "delay" does not need gas-release vents that might let water in and cause misfires. Because there are no hot gases, "No Vents" cannot burn the explosives charges. **Even black powder charges can be fired in rotation** — the first time this has been possible with a delay electric blasting cap.

These are only a few reasons why Patent 1,999,820, issued to Hercules Powder Company, is important to you. For more reasons, ask any of the thousands of satisfied users of "No Vents."

★ Ordinarily, no one pays attention to patents, but this Hercules patent is important to every user of explosives, not only because it covers a revolutionary new delay electric blasting cap, but because it is significant of what Hercules is doing for better blasting.

J-2

HERCULES POWDER COMPANY
INCORPORATED
972 KING STREET, WILMINGTON, DELAWARE

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offers you the world's fastest selling 3/8-yard excavator for bigger output and lower costs. Hundreds of these 10-B machines are making money for enthusiastic owners. Find out what this winner in the 3/8-yard class can do for you.

10-B shovel on clean-up work in the anthracite field for Glen Alden Coal Company, Audenried, Pa.

BUCYRUS ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN, U.S.A.

Not in the Contract

She: "There are lots of couples that don't pet in parked cars."
He: "Yes, the woods are full of them."

She "How's your companionate marriage coming on?"
He: "Not so good. I lost my wife's address."

Q.: "How do you know Annabelle is a good girl?"
A.: "Because she always brings home a Gideon Bible."

A colored man doing a hauling job was informed that he could not get his money until he submitted a statement. After much meditation, he evolved the following bill: "Three comes and three goes at four bits a went—$3."

Teacher: "Can you tell me the difference between a stoic and a cynic?"
Abie: "A stoic is a boid that brings the babies and a cynic is the place where you wash the dishes."

If every boy in the United States could read every girl's mind, the gasoline consumption would drop fifty per cent.

Lady Bountiful: "Here's a penny, my poor man. Tell me, how did you become so destitute?"
Beggar: "I was always like you, mum, a-givin' away vast sums ter the pore and needy at Christmas time."

Operator: "Hello! This is long distance. I have a call for you from Miami."
"Hello! This is Ben. Listen, Jack, I'm stranded here and need $100."
"I can't hear. Something is wrong with the 'phone."
"I want $100!"
"I can't hear you."
Operator: "I can hear it O. K."
"Well, you give him the $100."

"It was a toss-up whether I played golf or went to church."
"Really?"
"Yep. Had to toss up fifteen times before it turned golf."

She's a wholesome girl; she holds some six pints.

French Maid (screaming in the night): "Help! Help! Madame! Help!"

Madame (awakening): "Be brave, Mimi. I'll call my husband and send him in there."

French Maid: "But, madame, that's just it, he's in here now!"

The Eskimo sleeps in her white bear skin and sleeps very well I am told;
But last night I slept in my bare white skin and caught a helluva cold.

"How did George break his leg?"

"Well, do you see those steps over there?"

"Yes."

"Well, George didn't."

First Mechanic: "Which do you prefer, leather or fabric upholstering?"

Second Mechanic: "I like fabrics; leather is too hard to wipe your hands on."

A recruit was asked: "What are rabies, and how would you treat them?"

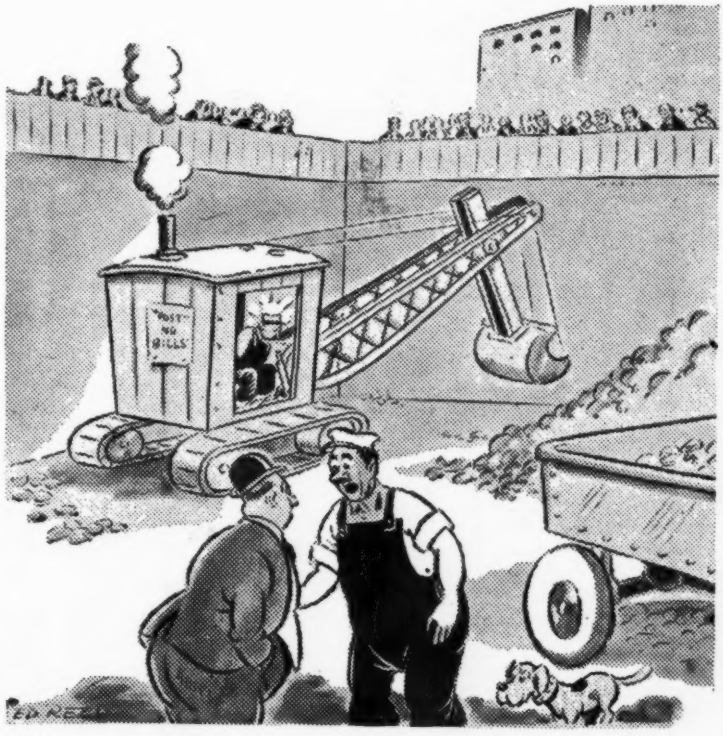
Imagine the examiner's surprise when he read: "Rabies are Jewish clergymen, and you dare not treat them for they are all very strict teetotalers."

First Partner: "The new stenographer's hair is decided blond, isn't it?"

Second Partner: "Yes, though I noticed a slight indecision around the roots."

Husband: "Let's have some fun this evening."
Bored Wife: "O. K., but please leave the light on in the hall if you get home before I do."

They were both ardent advocates of home brew. They felt they were experts, neither would concede that the other's was a better brew; so to settle the argument, down went the samples to the testing laboratory. This is the report they received back:
"We recommend that you do not work either of the two horses."



COURTESY ED REED—THE REGISTER & TRIBUNE SYNDICATE

"Hey, boss, I'm afraid Jones can't go on—he's got stage fright!"

GROUND
make their
any weather

PROGRESSIVE operators, whether the job is big or small, know that Firestone Ground Grip Tires give them the super-traction they need—save wear and tear on their equipment, and speed up the work. In addition to their use on buggies, road graders and other earth working equipment they are finding wide use on contractors' trucks and cars, where they must get through regardless of road or weather.

Firestone patented construction features are responsible for the amazing success of the new Firestone Ground Grip Tire. It is easy to see why the massive tread, with its scientifically designed and

For your convenience in writing to Firestone Tire & Rubber Company, you will find a card bound in this issue.

GRIP TIRES

own road . . . in . . . anywhere!

widely spaced bars of tougher rubber, gives you super-traction, and is self-cleaning. Of equal importance is the fact that the body of this tire is built with Gum-Dipped high stretch cords, giving the tire great strength to withstand the terrific stresses and strains of heavy pulling with low air pressure. In addition, there are two extra layers of Gum-Dipped cords under the tread, locking it inseparably to the cord body. These are patented Firestone construction features used in no other tire.

Equip now with Firestone Ground Grip Tires — they will save time and money for you on every job. When ordering new equipment be sure to specify Firestone Ground Grip Tires—the greatest traction tires ever built.

• • •

Listen to the Voice of Firestone featuring Richard Crooks or Nelson Eddy — with Margaret Speaks, Monday evenings over Nationwide N. B. C.—WEAF Network

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Firestone

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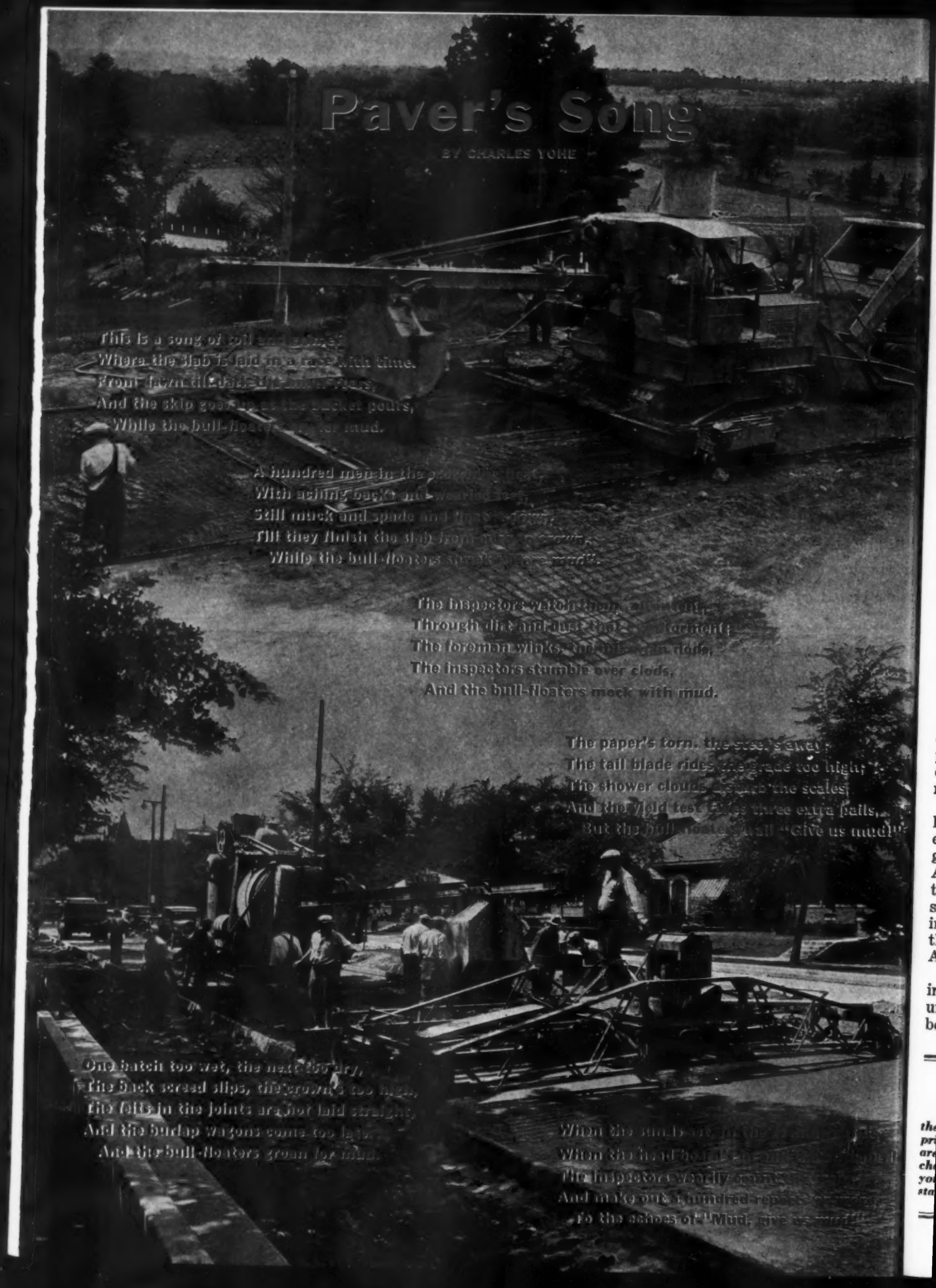


Paver's Song

BY CHARLES YORK

This is a song of toil and time,
Where the slab is laid in a race with time.
From form to blade the hours fly,
And the skip goes up as the bucket pours,
While the bull-floaters wait for mud.

A hundred men in the pouring heat,
With aching backs and weary feet,
Still muck and spade and trowel,
Till they finish the slab from curb to crown,
While the bull-floaters stumble over mud.

The inspectors watch them all the while,
Through dirt and dust they hide torment;
The foreman winks, the mix is made,
The inspectors stumble over clods,
And the bull-floaters mock with mud.

The paper's torn, the steel's askew;
The tail blade rides the grade too high;
The shower clouds obscure the scales;
And the yield test lacks three extra pails,
But the bull-floaters all "Give us mud!"

One batch too wet, the next too dry,
The back screed slips, the crown's too high,
The cuts in the joints are not laid straight,
And the burlap wagons come too late,
And the bull-floaters groan for mud.

When the sun is [illegible]
When the hand board [illegible]
The inspectors weakly [illegible]
And make out a hundred [illegible]
To the echoes of "Mud, give us mud!"

EXCAVATING ENGINEER

● *Many contractors are finding profitable work in the construction of secondary and feeder roads. The illustration shows Contractor C. F. Goeringer of Wilkes-Barre, grading a Pennsylvania road.*

1936 Highway Forecast

Preliminary figures indicate biggest construction year since 1931 . . . Federal funds finance a large portion of the work . . . State construction programs show increases ranging up to 90 per cent over last year . . . Highway safety now receiving nation-wide attention . . . Efforts continued to stop diversion of gas tax.

THE HIGHWAY construction program is now back in a steady stride that enables contractors and producers of highway materials to make plans with assurance that no sudden dip in the program is in immediate prospect.

The construction chart for the last decade shows that 1933 marked low-tide in the highway program. The Hayden-Cartwright Act of 1934 has demonstrated that it was the greatest single stabilizing influence that has been injected into highway affairs since the enactment of the first Federal Aid act of 1916.

New factors have been injected into highway affairs, and these undoubtedly will have a material bearing upon the highway legislation that may be enacted at the present session of Congress. Heading the list of these new factors is highway safety. This is not a new subject, but it has become of major interest because of the alarming death toll taken by traffic accidents and it will enter into all future consideration of basic highway programs.

The public today is not only demanding good roads but it is also demanding safe roads. The three major factors entering into traffic safety are the driver, the vehicle, and the road (the pedestrian is not under discussion in this connection). Road builders are concerned with the element of safety so far as it enters into the construction of highways and streets.

Newspapers, magazines and radio stations throughout the country are centering public attention upon the necessity of curbing the traffic toll. Properly directed, this concerted campaign in behalf of safety can be made a powerful factor in maintaining an adequate highway program. From a strictly business standpoint, the designers and builders of American highways must take into consideration and make the most of a national campaign for traffic safety. Evidence that proper recognition is being taken of this appears in the fact that a full session of the approaching Convention of the American Road Builders' Association (Cleveland, January 20-24) will be devoted to highway traffic safety.

As stated at the outset of this report, the current and immediate future highway construction pro-

Frontispiece

A few two-color reproductions of the illustrated poem by Charles Yohe printed on heavy enamel poster paper are available to our readers without charge. If you would like a copy for your bulletin board send six cents in stamps to cover mailing charges.

● *Hanrahan & Wilcox Corporation, San Francisco, use Caterpillar Diesel 75s with LeTourneau carryalls on a 600,000-yard excavation project near Santa Barbara, California.*

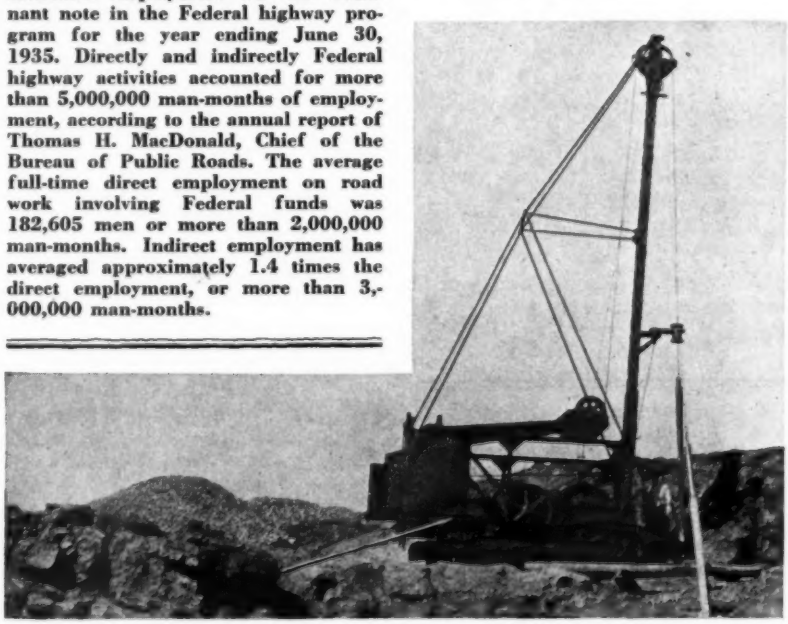
gram is decidedly on the up-grade. The 1936 program will involve the expenditure of approximately $875,000,000, independent of what will be spent by the Works Progress Administration on farm-to-market roads. This vast sum is available for construction by the contract system. The WPA is not contracting its road work at present, but strong efforts are being made to bring the largest possible amount of this work under the contract system.

Rules and regulations issued by the Department of Agriculture for expenditure of emergency relief funds resulted in considerable confusion at the very time the 1935-36 highway program was being launched. These regulations, as originally issued relating to relief labor quotas and man-hours of work, made it impossible for state highway departments to place their programs in operation. Subsequent amendments enabled the work to proceed, but it was impossible to make up the two months that were lost.

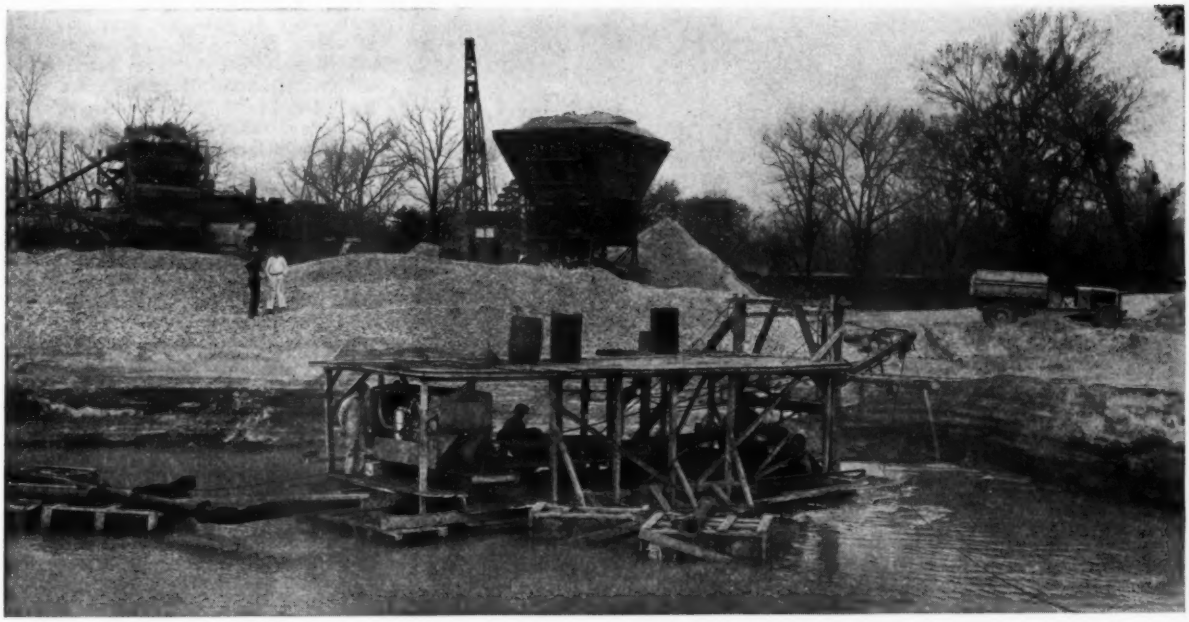
The Hayden-Cartwright Act provides for a continuing highway program through 1937 but there is strong possibility that highways will receive additional funds as the result of legislative action during the present session of Congress. The President has disclosed that the administration will seek an appropriation of $500,000,000 to carry out projects already approved by the PWA. Many of these projects cover highway and street work.

The year now closing represents a long stride in the recovery of the highway industry, but it is clearly apparent from official figures that the "big push" lies immediately ahead. The various state programs are just now getting into full swing, and the same is true for the WPA farm-to-market road program.

Increased employment was the dominant note in the Federal highway program for the year ending June 30, 1935. Directly and indirectly Federal highway activities accounted for more than 5,000,000 man-months of employment, according to the annual report of Thomas H. MacDonald, Chief of the Bureau of Public Roads. The average full-time direct employment on road work involving Federal funds was 182,605 men or more than 2,000,000 man-months. Indirect employment has averaged approximately 1.4 times the direct employment, or more than 3,000,000 man-months.



● *The modern all-steel blast-hole drill helps to cut costs in getting out crushed stone. This Bucyrus-Armstrong Model 29 drill is operated by Joseph Walker of Gloversville, New York.*



● *A Caterpillar Diesel power unit supplies low cost power for driving the dredge pump at the Benton, Alabama, plant of the J. H. Whigham Gravel Company of Montgomery.*

Forecasts by States

Alabama

If all Federal applications now pending are approved and placed under operation, the total expenditure of Federal, state, and county funds for highway construction in Alabama during 1936 will reach approximately $26,800,000, and more than 2600 miles of highway will be effected, according to information received from A. Reese Harvey, Office Engineer.

Should Federal authorities approve for state matching of Federal Aid applications now pending, the amount programmed from Federal Aid funds will be $5,200,000. The Emergency Federal Relief has appropriated $8,317,732 for highway and grade elimination projects. The Works Progress Administration applications pending Federal approval amount to approximately $6,000,000. Alabama will receive approximately $5,200,000 from the state gas tax and approximately $2,300,000 from auto license fees and other revenues.

It is estimated that approximately $2,000,000 will be programmed for grading and drainage work and about $22,000,000 for reconstruction of bases and surfaces. It is understood that the reconstruction operation will include, of course, a large amount of excavation.

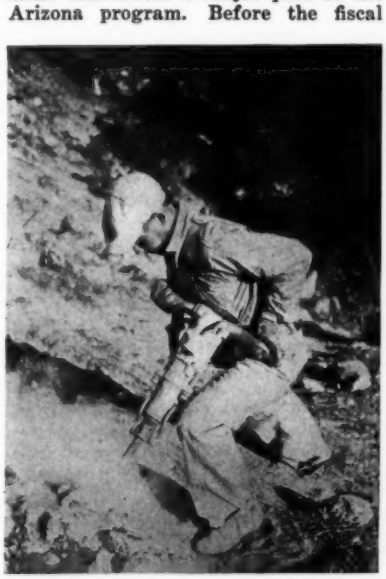
The present program, if all Federal projects are approved that are now pending, will increase the volume of expenditures over the previous year approximately ninety per cent (90%).

Under the new public works program, financed from the Emergency Relief Appropriation Act of 1935, PWA allotted loans and grants of $19,000,000 for 220 local street and highway projects estimated to cost $37,000,000. These allotments were made for projects that are not located on Federal Aid highways.

Under the first public works program PWA allocated $400,000,000 to the Bureau of Public Roads for expenditure in conjunction with the State Highway Departments, but under the new program the allocation to the Bureau of Roads was made by the President's Advisory Committee on Allotments.

Arizona

The highway program in Arizona covers a fiscal year beginning July 1st, 1935 and ending June 30th, 1936, with approximately $8,700,000 to be spent in that period. According to T. S. O'Connell, State Highway Engineer, it is expected that $7,400,000 will be spent on construction work, $1,100,000 on maintenance, and $200,000 for other purposes. Federal Aid to the extent of $1,800,000 has been allotted to Arizona through the Hayden-Cartwright Bill. Approximately $800,000 was carried over from the original NIRA appropriation. $3,800,000 is Arizona's part of the Public Works Relief Bill. In addition to these Federal funds, the state gas tax provides a further sum of $1,560,000, and vehicle license fees, etc. account for another $700,000. Highway construction and improvement constitutes a major part of the Arizona program. Before the fiscal



● *On a California road job, the operator uses a Sullivan L-2 rock drill in preparation for a blast.*

● *Geo. W. Orr Contracting Company, El Paso, recently completed a 3.9-mile road project in Arizona which involved 350,000 yards of excavation, practically all rock. The illustration above shows their Bucyrus-Erie 43-B loading to a 12-yard steel wheel dump wagon pulled by a Caterpillar tractor.*

year ends on June 30th, 6 miles of concrete, 1.7 miles of asphalt, 130 miles of oil process, 110 miles of gravel surface, and 133 miles of grading including drainage structures will have been completed.

Arkansas

Under the provisions of the Works Progress Administration appropriation made available by the last Congress, the state of Arkansas was allocated approximately $3,500,000 for grade separation and protection projects and $3,400,000 for highway construction. Of this total amount, according to W. W. Zass, Chief Engineer, approximately thirty per cent has been placed under contract, an additional forty per cent is ready for advertisement and receipt of proposals, and plans for the remaining thirty per cent are in an advanced stage of completion. It is anticipated that practically all WPA funds will be placed under contract during the sixty to ninety-day period immediately following January 1, 1936. The state will have no funds available for new construction for the 1936 calendar year, either for the matching of normal Federal Aid or for use as an entity, other than the funds cited above. The complete WPA program includes the following improvements: 316 miles of grading, minor drainage, gravel surfacing at a cost of $2,200,000; 144 miles of bituminous surfacing at a cost of $1,500,000; 5 miles of concrete pavement at a cost of $124,000; 28 grade crossing protection installations, $140,000; 34 overpass or underpass structures, $2,400,000; and 14 bridges at a cost of $530,000.

An expenditure of $100,000,000 for highways initiates a movement, according to an analysis made by the Bureau of Public Roads, resulting in the transaction of business to the extent of $315,000,000 and causing the employment of 103,000 men for one year.

California

The current fiscal biennium in California is seeing highway construction activity carried along upon a scale never before known. The combination of the Division of Highways' budget, regular Federal Aid and WPA funds has provided for this unusual number of projects, giving assurance that this phase of public works will more than carry its share of unemployment relief.

The $61,000,000 California state highway budget for the two-year period from July 1, 1935, to June 30, 1937, allocates $21,545,370 for major construction projects. The funds upon which this budget is based are derived from the Division of Highways' share of state revenues of gasoline tax and motor vehicle registration fees and an estimated revenue of $9,513,919 in regular Federal Aid funds.

Forty-five major budgeted projects, totaling $6,530,284, have been placed under contract since July 1st, leaving a balance of $15,000,000 available for state highway construction during the next eighteen months.

In addition to this $6,530,284 in projects included in the current construction budget, other contract work, covering 101 projects at a total cost of $2,832,603 and financed from maintenance, minor improvement, and the previous biennium's funds, was awarded and work started during the past six months.

The sum of these two figures—$9,362,887 — represents regular construction activities on the California state highway system for the last six months of 1935.

Added to this total are the projects made possible by virtue of Federal funds allocated to California under the WPA.

The California allocation of the Works Program Highway funds amounted to $7,747,928. By the end of 1935, $5,073,603 of this allotment had been obligated on 44 highway construction projects, prepared under the stipulations of the Federal provisions governing these funds, leaving a balance of approximately $2,670,000 to be spent in 1936. These 44 highway construction projects are estimated to provide 3,402,000 man-hours labor.

For Works Program Grade Crossing projects, California was allocated $7,486,362. At the beginning of this year thirty-four grade crossing elimination projects to cost $6,051,235 have been set in motion by awarding of contract, opening bids, or advertising for bids.

These thirty-four grade separation projects will provide about 3,100,000 man-hours labor.

The following summary may provide a clearer conception of the situation with the California Division of Highways since July 1st, last.

Major Construction (As of January 1, 1936)

			Under Way & Advertised	
	Funds	Allocation	No. of Projects	Amount
1.	State Highway Fund (State revenue & Federal Aid)	$21,545,370	45	$6,530,284
2.	Miscellaneous funds		101	2,832,603
3.	Works Program Highway	7,747,928	44	5,073,603
4.	Works Program Grade Crossing	7,486,362	34	6,051,235
		$36,779,660	224	$20,487,725

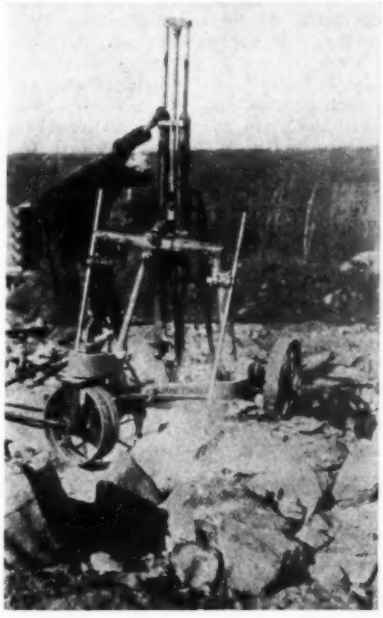
It is seen from the above summary that, not including the $2,832,603 in projects financed from miscellaneous funds not listed in the allocation column, California has some $19,124,538 remaining for major construction projects to be put under way during the next year and a half.

Colorado

Since the Highway Advisory Board does not meet until shortly after the first of the year, exact information about highway construction for 1936 is not yet available. However, O. T. Reedy, Senior Assistant Highway Engineer, estimates that between four and five million dollars in state funds will be spent during the coming year on road work.

In addition, Public Works Program funds include $2,600,000 for highway construction and $2,300,000 for grade crossings. Regular Federal Aid also gives the state about $1,600,000.

During 1935 there were 43 major projects started and completed under jurisdiction of the Engineering Department and 39 light oiling projects completed by the Maintenance Department. Forty-one other projects were carried over from 1934 and finished during 1935.



● *A rock quarry in Connecticut makes good use of this Sullivan Type U-121 wagon drill.*

Connecticut

While an exact estimate for 1936 expenditures is not available at this time, C. G. Nichols, Executive Deputy Commissioner of the Connecticut State Highway Department, states that the amount to be spent will probably total about $25,000,000. Of this sum approximately $19,500,000 will be used for construction work, $3,300,000 for maintenance, and $2,200,000 for other purposes.

Work carried over from 1935 totals nearly $2,000,000 which will be spent on gravel, macadam, bituminous macadam, and bituminous concrete roads, and seven new bridges. Financing of the work in 1936 will be managed through the following means: Bonds, $7,500,000; gasoline tax, $8,000,000; motor vehicle fees, $4,500,000; other sources, $5,000,000. Federal Aid amounting to $3,000,000 is included in the above.

Work will be continued on Connecticut's Merritt Parkway now that Fairfield County commissioners have authorized a $15,000,000 bond issue to finance the work. The money needed as work progresses may be borrowed from time to time by the proper county officials with the approval of the Merritt Parkway Committee. It has been urged that $3,000,000 worth of bonds be issued immediately,

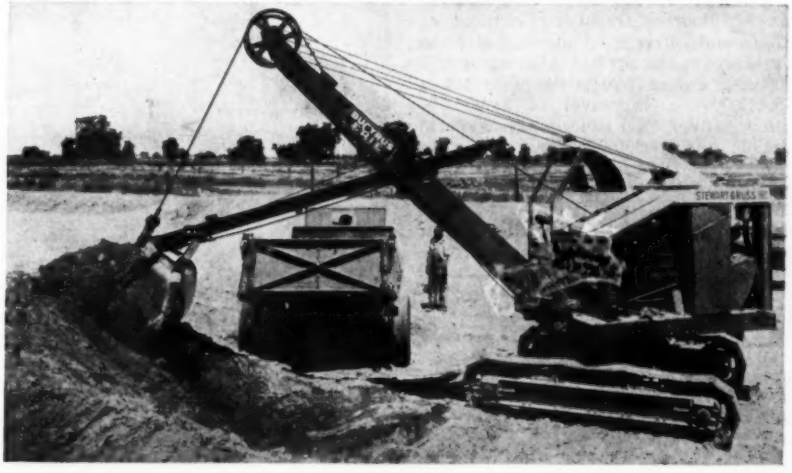
● *In Rocky Mountain National Park, Driscoll Construction Company, Pueblo, Colorado, hauls fill material in Koehring Dumptors.*

Delaware

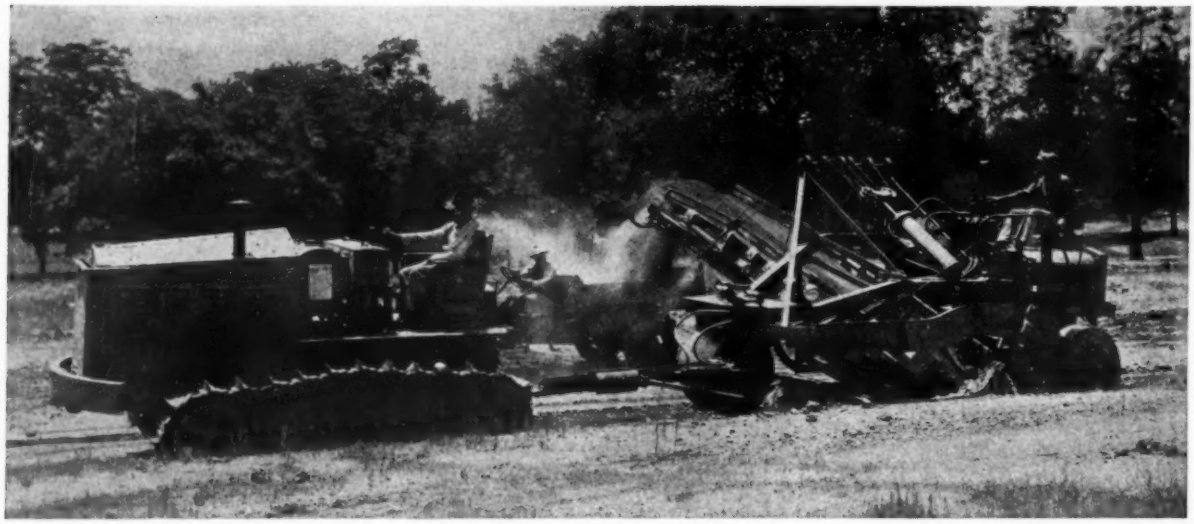
A preliminary estimate of highway expenditures program for 1936 in Delaware shows a 15 per cent increase over the amount expended in 1935.

Sources of income, according to Samuel Knopf, Principal Assistant Engineer, are estimated as follows: Federal Aid (Hayden-Cartwright Act), $400,000; 1935 Federal Emergency Relief and Appropriation Act, $1,300,000; state gas tax, $1,300,000; and vehicle license fees and other sources, $900,000.

Construction work program for 1936 will be: 35 miles of grading for $225,000 with 110,000 yards of excavation involved; 150 miles of slag or crushed stone surfacing for $900,000 requiring 90,000 tons of material; 150 miles oil treated surfacing for $110,000 requiring 20,000 tons of material; 25 miles of high type paving for $700,000; 50 miles



● *Stewart & Nuss, Inc., Fresno, use their ⅜-yard shovel on a highway widening project in Kings County, California. Loading to two-yard Ford dump trucks the machine moves approximately 400 yards per 8-hour day.*



● *Loading to small trucks, this Austin-Western three-wheeled elevating grader obtained outputs up to 250 yards per hour on this Georgia road job. A Cletrac tractor pulled the grader along in fine style for Contractor Irvin Bryant of Pine Park, Georgia.*

of widening to existing concrete pavement for $300,000; and four bridges for $200,000. Maintenance work during the year will absorb approximately $850,000 of the funds available to the highway department.

No figures are available showing the amount of highway excavation contracted for in 1935 or previously which will be carried over into 1936.

Mr. Knopf states that contracts on projects financed with WPA money require most of the excavation and borrow pit work to be carried on by hand labor in order to absorb the man-hours set up in the contracts.

Florida

Approximately $16,500,000 is expected to be available for highway work in Florida during 1936, according to W. M. Boozer, Division Engineer of Plans and Surveys. Federal Aid from the Hayden-Cartwright bill totals $2,500,000; Public Works Program totals $5,425,000; a carryover of $1,000,000 comes from the Emergency Federal Relief; and $7,500,000 from the state gas tax. It is estimated that $9,700,000 will be used on construction work and $3,700,000 on maintenance. Earned and unpaid obligations account for much of the rest of the money to be expended. 200 miles of grading work

● *Concrete for culverts on D. A. Y. Construction Company's highway job near Lebanon, Indiana, was mixed in a Koehring Dandie 10-S mixer.*

amounting to $2,000,000 are planned. 100 miles of high and medium type paving will account for another $2,000,000. Low type paving projects will take $1,000,000. Fifty bridges and approaches, including grade separations, will amount to $4,000,000. Altogether, it is estimated that highway work for 1936 will represent a 20% increase over similar work done in 1935.

Georgia

Complete information regarding Georgia's 1936 highway program is not available as the details have not yet been completed. From preliminary figures, the total income for highway purposes will be $25,300,000, according to information received from the State Highway Board. This income is based upon receiving: regular Federal Aid,

● *Overhauling the 35-year-old highway bridge across the Missouri River at Omaha. The illustration shows the operator welding a strengthening plate to the old bridge member using Lincoln Electric arc welder and electrodes.*

$3,000,000; Emergency Federal Relief (NIRA), $2,000,000; 1935 Works Relief Bill, $10,000,000; state gas tax, $9,000,000; vehicle license fees and others, $1,300,000.

Of the above, approximately $17,500,000 will be used on construction work, while the balance will be devoted to maintainence, departmental expenses, and to retire indebtedness to the counties which the Highway Department has assumed under the laws in Georgia, and which will require approximately $2,500,000. While the complete construction program has not yet been prepared, it is estimated that approximately $8,000,000 will be used for grading work.

Idaho

The highway construction program for 1936 in Idaho shows a very considerable gain over last year. The forecast for 1936 shows over $6,000,000 allotted to construction projects as compared to the $2,500,000 estimated a year ago.

The anticipated income, according to G. E. McKelvey, Commissioner of Public Works, includes: Federal Aid (regular Federal Aid and Public Domain), $1,531,162; Emergency Federal Relief (NIRA), $130,622; 1935 Federal Emergency Relief and Appropriation Act, $3,897,226; and state gas tax $2,500,000. After providing for maintenance requirements of $1,200,000 and the necessary funds for other departmental expenses, it is estimated that there will be available for construction work $6,410,010.

A tentative program distributes the construction funds as follows: 288 miles of grading for $2,650,010; 225 miles of gravel or crushed stone surfacing for $688,000; 145 miles of oil treated surfacing for $1,262,000; and 28 bridges costing $1,810,000.

Illinois

According to information received from the Division of Highways, Illinois expects to build in 1936 about 130 miles of high type paving, 35 miles of bituminous resurfacing, 135 miles of gravel or crushed stone surfacing, 575 miles of grading, and 125 separate bridges. A large portion of the grading mileage consists of secondary road improvements under the U. S. Works Program, and on a considerable portion of this the counties expect to surface with gravel after the state has completed the grading work.

The estimated cost of the 1936 construction is $32,000,000. This will be an increase of about 30 per cent over 1935 construction expenditures. The sources from which these funds will be expended and the approximate amounts are: $5,000,000 from regular Federal Aid funds; $500,000 from the second N.R.A. allotment; $19,000,000 from Works funds; $500,000 from P.W.A. grants; and $7,000,000 from state funds.

The estimates given, both as to mileages and funds, include contracts awarded in 1935 and carried over into 1936 for completion.

The highway continuation program under the state highway departments for 1936, as summarized by Charles M. Upham, Engineer-Director of the American Road Builders' Association, should be the largest since 1931.

Of the 1935-36 Federal Aid allotment there should be approximately $50,000,000 available January 1, 1936. On July 1st there will be available an additional $125,000,000. Unobligated funds from the $400,000,000 highway and grade crossing relief appropriation will amount to about $300,000,000 on the first of the year. Assuming that the states will be able to match Federal Aid, this will add $175,000,000 with possibly another $50,000,000 to spare.

This will make a total of $700,000,000 for construction. There will be about $175,000,000 spent on maintenance, making a grand total of $875,000,000.

This compares with a peak figure of $979,000,000 spent in 1931; $816,000,000 in 1932; $666,000,000 in 1933; $826,000,000 in 1934 and an estimated $675,000,000 in 1935.

The estimated expenditure for 1936 does not take into consideration possible further relief appropriations by the next Congress.

In addition to the state highway program, there will be highway and street projects under the Public Works Administration amounting to about $125,000,000 in 1936.

Under Works Progress Administration there will be spent about $500,000,000 on farm-to-market roads and approximately $200,000,000 on city streets. With another $200,000,000 for city, county, and township maintenance the 1936 street and highway construction and maintenance program will total $1,900,000,000.

Indiana

A preliminary estimate of Indiana's highway activities for 1936 shows that the construction expenditures will be about six per cent larger than they were in 1935.

According to information received from the State Highway Commission, the anticipated income of the highway department will total $19,640,000 derived from the following sources: regular Federal Aid, $3,087,613; Emergency Federal Relief (NIRA), $1,500,000; the 1935 Emergency Relief Appropriation Act, $10,052,400; and from the state gas tax, vehicle license fees, and other sources $5,000,000.

New construction will use approximately $14,740,000 of the total departmental income. Maintenance work will require approximately $3,400,000 while other departmental costs will consume the balance.

It is impossible at this time to foretell the exact distribution of the construction funds, but in general $4,700,000 will be used for grading; $6,100,000 will be used for surfacing of various types and materials; and the balance will be available for the construction of bridges.

Iowa

According to information received from the State Highway Commission, Iowa expects to have $31,300,000 available for highway work during 1936. This proposed expenditure represents an increase of approximately 50 per cent over last year's.

The highway fund will be derived from the following sources: regular Federal Aid, $4,500,000; Emergency Federal Relief (NIRA), $1,000,000; 1935 Emergency Relief and Appropriation Act $10,600,000; state gas tax $6,300,000; and vehicle license fees and other sources $8,900,000.

Of the above funds it is proposed to spend $16,700,000 for new constructions; $3,600,000 for maintenance; and $11,000,000 for other purposes.

The proposed construction program consists of: 500 miles of grading for $3,900,000 involving 12,000,000 yards of excavation; 370 miles of gravel or crushed stone surfacing for $800,000 requiring 500,000 tons of surfacing material; 230 miles of oil treated surfacing for $1,500,000; 250 miles of high

● *Tri-Lake Construction Company of Columbia City, Indiana, cast in a new grade on their Highway 30 road job in Indiana.*

United States Public Works Road Construction—N. I. R. A.

As of November 30, 1935

STATE	APPORTIONMENTS		COMPLETED				UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS	
	Sec. 204 of the Act of June 16, 1933 (1934 Fund)	Act of June 18, 1934 (1935 Fund)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds
Alabama	$ 8,370,133	$ 4,299,842	$ 12,632,756	$ 7,693,668	$ 1,775,239	666.2	$ 2,272,816	$ 595,486	$ 1,520,372	93.1	$ 11,886	$ 393,076	13.2	$ 69,093	$ 571,154
Arizona	5,211,960	2,641,935	8,024,517	5,061,654	2,023,015	522.9	754,891	133,822	507,347	22.3		32,390	.5	16,484	79,183
Arkansas	6,746,335	3,428,049	8,802,708	6,253,820	1,690,419	474.6	1,890,977	279,635	1,504,476	124.4	149,928	73,548	6.5	64,953	159,606
California	15,607,354	7,932,206	25,052,065	15,123,463	4,789,981	728.2	5,108,431	478,067	2,776,765	44.8		194,947	.7	5,824	170,511
Colorado	6,874,530	3,486,006	11,046,871	6,810,235	3,372,945	639.4	104,162	9,323	94,839	6.0				54,972	18,222
Connecticut	2,865,740	1,454,868	4,216,908	2,859,541	942,378	69.3	359,166		343,645	3.7		58,859	.1	6,199	109,586
Delaware	1,819,068	923,395	2,643,119	1,818,961	770,456	129.3	43,114		43,114					126	109,825
Florida	5,231,834	2,661,343	7,831,039	5,139,970	1,508,626	265.8	997,002	29,832	876,989	41.5		178,968	1.7	62,032	96,760
Georgia	10,091,185	5,113,491	11,294,299	8,909,817	1,980,930	642.3	1,652,417	696,214	908,178	82.1	87,819	552,742	25.8	397,335	1,671,639
Idaho	4,486,249	2,277,486	6,165,523	4,416,836	1,385,396	479.4	645,401		644,152	18.0		56,567	2.8	69,413	191,372
Illinois	17,570,770	8,921,401	18,507,797	14,691,893	3,323,471	528.5	7,433,890	2,769,522	4,664,368	164.1		363,062	2.0	109,355	570,500
Indiana	10,037,843	5,088,963	10,858,684	9,077,334	1,345,364	318.3	4,227,962	791,499	3,401,071	168.2	51,719	80,140	2.2	117,290	262,389
Iowa	10,055,660	5,118,361	15,062,366	9,883,155	4,404,811	1,196.3	667,507	170,404	457,100	28.9		1,000	2.3	2,101	255,450
Kansas	10,089,604	5,117,675	13,698,565	9,992,654	3,338,905	1,059.3	1,814,435	39,153	1,752,734	82.2	48,916	21,226	2.2	6,878	4,810
Kentucky	7,517,359	3,818,311	9,768,148	6,906,083	2,307,991	722.1	1,865,608	508,224	1,163,173	82.9	55,361	134,047	14.7	47,671	213,102
Louisiana	5,828,591	2,963,932	6,363,361	4,565,079	1,239,927	192.8	2,402,139	1,058,401	1,301,785	52.9	155,417	376,293	17.1	49,695	45,927
Maine	3,369,917	1,711,586	4,908,431	3,347,218	1,366,107	184.0	299,803		299,788	9.0				22,699	45,691
Maryland	3,564,527	1,810,058	3,337,991	2,654,437	600,931	113.2	1,911,608	814,974	870,944	29.5		347,376	5.6	95,116	590,807
Massachusetts	6,597,100	3,350,474	6,663,406	4,589,803	1,490,629	100.1	3,533,896	1,974,233	1,559,563	15.2				32,964	300,283
Michigan	12,736,227	6,452,568	17,067,079	12,486,352	3,679,826	637.8	2,939,652	181,827	2,697,425	131.0		44,725	.1	68,048	30,592
Minnesota	10,656,569	5,425,551	15,213,536	9,915,264	4,649,353	1,614.5	1,026,898	625,234	326,027	34.5	4,974	193,990	1.8	111,098	256,180
Mississippi	6,978,675	3,540,227	9,426,502	5,637,571	1,253,577	542.4	3,275,715	1,202,529	1,711,276	175.5	7,240	424,827	23.1	131,335	150,547
Missouri	12,180,306	6,173,740	14,009,606	10,650,272	2,516,802	1,280.9	4,934,807	1,401,152	3,325,773	169.9		270,597	.6	128,882	60,567
Montana	7,439,748	3,769,734	11,001,836	7,142,543	3,224,257	996.7	601,107	155,193	445,914	27.0	47,265		7.2	94,746	99,563
Nebraska	7,828,961	3,968,364	11,334,475	7,752,426	2,389,671	966.1	1,791,666	34,041	1,466,441	67.8		2,890	.1	42,495	105,362
Nevada	4,345,917	2,302,356	6,840,601	4,502,450	1,985,406	735.6	359,003	26,150	296,747	21.7		1,650		17,317	18,553
New Hampshire	1,909,839	969,462	2,708,347	1,736,686	869,856	73.4	64,751		64,751	.4	172,557	11,610	4.0	396	23,245
New Jersey	6,346,039	3,220,879	6,945,166	6,014,766	573,497	75.6	2,680,445	175,941	2,187,571	12.5				155,332	459,811
New Mexico	5,792,935	2,941,700	8,132,696	5,597,600	2,356,078	749.0	476,768	37,087	439,281	19.7				158,247	146,342
New York	22,530,101	11,327,921	33,493,920	21,273,118	6,845,227	710.0	6,391,294	881,051	3,796,672	112.9	12,000	197,250	.4	163,933	486,772
North Carolina	9,522,293	4,840,941	13,460,464	8,782,872	3,443,982	1,273.3	1,436,786	361,426	1,058,466	72.5	64,450	256,483	4.6	313,545	82,010
North Dakota	5,804,448	2,934,967	7,330,724	5,535,549	1,160,838	1,937.0	727,277	130,778	530,181	115.9	73,549	535,989	70.2	64,573	711,958
Ohio	15,484,592	7,865,012	21,449,131	15,279,029	4,598,579	729.4	3,016,201	161,431	2,617,675	46.2		464,072	13.3	44,132	184,686
Oklahoma	9,216,798	4,685,180	12,570,003	8,874,286	2,888,902	747.7	1,640,267	323,398	1,295,626	55.3		157,418	1.2	19,114	343,235
Oregon	6,106,896	3,097,814	9,390,442	5,905,905	2,676,970	461.4	434,974	99,039	264,264	4.0	518			101,434	156,580
Pennsylvania	18,891,004	9,590,788	26,935,166	17,838,787	7,914,430	983.0	1,909,182	824,982	997,947	97.9	5,126	313,372	2.1	222,109	365,038
Rhode Island	1,998,708	1,014,572	2,683,878	1,944,409	645,099	78.0	342,956		342,956	8.2	50,004	6,400	3.0	4,295	20,117
South Carolina	5,459,165	2,770,954	5,798,581	4,956,743	733,453	444.7	1,997,871	375,718	1,581,760	174.5	15,740	52,612	.2	110,964	403,130
South Dakota	6,011,479	3,047,643	8,440,333	5,735,919	2,155,866	1,453.1	493,947	63,435	430,512	67.8	6,425	377,865	30.2	205,699	83,401
Tennessee	8,492,619	4,302,991	11,418,657	8,109,360	2,411,687	440.2	1,674,652	242,654	1,335,596	41.3	14,917	218,803	3.1	125,688	336,905
Texas	24,244,024	12,291,253	31,647,062	23,290,457	6,777,509	2,554.8	5,808,806	554,065	5,032,249	216.1	265,315	361,123	20.9	34,186	120,372
Utah	4,194,708	2,132,691	6,508,661	4,000,360	1,743,966	574.5	670,555	167,060	352,191	16.5		1,000		27,288	35,534
Vermont	1,867,573	948,007	3,008,839	1,831,050	848,613	137.2	109,059	3,922	50,873	2.4		2,713		32,601	5,808
Virginia	7,416,797	3,765,387	10,871,897	7,102,575	2,893,222	553.2	885,456	195,954	648,068	64.3	42,221	44,360	.7	76,007	179,736
Washington	6,115,867	3,106,412	8,360,578	5,902,257	2,243,798	291.1	1,002,931	198,743	798,090	11.7		8,673		14,867	55,851
West Virginia	4,474,234	2,280,335	5,186,232	4,169,090	861,104	182.6	1,262,572	269,126	960,378	35.8	8,585	51,810	.1	27,474	407,044
Wisconsin	9,724,881	4,941,831	14,546,899	9,653,297	4,075,468	604.2	810,676	7,300	749,370	15.1		97,922	1.2	64,284	19,077
Wyoming	4,501,327	2,287,712	6,482,834	4,446,531	1,850,903	977.1	453,856	46,705	380,415	60.2		56,394		8,091	
District of Columbia	1,918,469	973,842	2,542,275	1,918,173	624,102	18.6	153,249		153,249	1.4		160,094	2.1	296	36,398
Hawaii	1,871,062	949,778	1,504,948	1,130,620		32.2	1,417,635	700,733	543,829	19.0	39,709	169,484	2.9		236,464
TOTALS	394,000,000	200,000,000	532,988,922	369,012,098	120,549,562	31,887.3	88,775,941	19,795,563	61,013,976	2,968.0	1,391,663	7,348,367	289.6	3,800,676	11,088,095

● *The enlarged highway construction program for 1936 will create more work at crushed stone and cement plants. This heavy-duty 3-yard electric shovel is operated by the Dewey Portland Cement Company at its quarry near Davenport, Iowa.*

type paving for $7,300,000; and 107 bridges for $3,200,000. In this last item are included all single bridges and railroad crossing structures while all bridges and culverts on grading projects are included in the first item.

Kansas

Since Kansas' 1936 construction program is still more or less tentative, State Highway Engineer H. D. Barnes can offer only a preliminary estimate of next year's activities.

It is expected that the total amount of money available for the 1936 highway program will be $22,929,000. This is an increase of 75 per cent over 1935.

This money will be made available from the following sources and in the following approximate amounts: regular Federal Aid, $3,300,000; Emergency Relief Program (by Federal funds which were appropriations for flood relief and which must be matched by an equal amount of state funds), $300,000; 1935 Works Relief Bill, $10,241,000; PWA loan and grant, $1,388,000; and state funds (state gasoline tax, vehicle license fees, etc.) $7,700,000.

It is expected that construction requirements will absorb $18,829,000 of the total highway funds available. Maintenance work will require $3,000,000 and approximately $1,100,000 will be used for resurfacing light type roads.

While all of the 1936 highway program has not been approved, Engineer Barnes states that it is expected the construction funds will be used as follows: 488 miles of grading and culverts at an estimated cost of $6,300,000; 428 miles of light type surfacing of sand, gravel or crushed stone for $650,000; 476 miles of bituminous mat for $2,497,000; 85 miles of high type pavement (rural and city streets) for $3,300,000 and 147 bridges at an estimated cost of $6,082,000.

Since most of the 1935 projects were completed, the carryover into 1936 will be negligible.

Kentucky

It is not possible to give at this time a reasonably accurate forecast of work to be done by the State Highway Department of Kentucky in 1936 because the complete program will not be made up until later in the year. Kentucky's fiscal year does not begin until April 1, 1936, and in addition the State Legislature will be in session from January 1, 1936 until April 1. Kentucky's road program is dependent upon action taken by the Legislature.

For that reason no attempt has been made to estimate new construction that may be undertaken with state funds. Chief Engineer W. O. Snyder states that the estimated cost to complete highway work now under contract is $4,931,000.

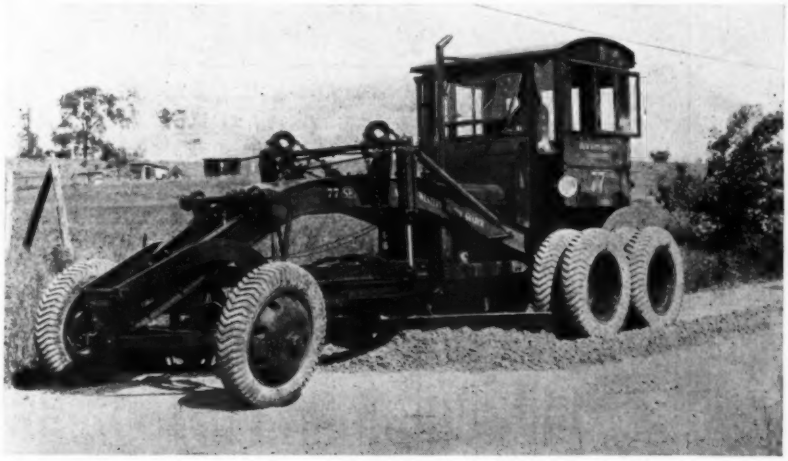
The Federal allotment to Kentucky of Works Program highway funds was $3,726,000. Approximately $2,500,000 of this had been awarded or advertised for letting by January 1, 1936, leaving a balance of $1,226,000 to be placed under contract in 1936.

The allotment of Works Program grade crossing funds was $3,672,000. Up to January 1, 1936, approximately $2,500,000 of this allotment had been awarded or advertised for letting, leaving a balance of $1,172,000 to be placed under contract in 1936.

The regular Federal Aid allotment to Kentucky is $2,300,000. Approximately $1,150,000 has already been obligated,

President Roosevelt has approved a program of bridge construction work on the route of the Inter-American highway in Central America, according to an announcement by the U. S. Bureau of Public Roads in charge of activities on the highway.

Congress in June, 1934, appropriated $1,000,000 "to meet such expenses as the President in his discretion may deem necessary to enable the United States to cooperate with the several Governments, members of the Pan-American Union, in connection with survey and construction of the proposed Inter-American Highway." As the initial activity under this program, the Bureau of Public Roads has arranged for the construction of three bridges, the total estimated expenditure being $340,000, located, one each in Panama, Honduras, and Guatemala.



● *Expenditures for road maintenance will be greater this year. Downers Grove Township, Illinois, keeps its gravel roads smooth with this Austin-Western No. 77 Diesel-powered motor grader.*

Report on Federal Aid Highway Projects

(1936 funds only)
As of November 30, 1935

STATE	APPORTIONMENT	COMPLETED			UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS
		Estimated Total Cost	FEDERAL AID	Miles	Estimated Total Cost	FEDERAL AID	Miles	Estimated Total Cost	FEDERAL AID	Miles	
Alabama	2,604,320										2,604,320.00
Arizona	1,781,347				1,389,215.53	1,198,466.20	85.7	388,436.65	320,641.34	10.0	262,239.46
Arkansas	2,142,723										2,142,723.00
California	4,756,959				1,197,001.30	693,492.57	12.7	2,103,127.43	1,207,287.26	35.0	2,856,179.17
Colorado	2,288,811				865,168.84	484,509.67	36.1	362,807.16	203,171.98	15.5	1,601,129.35
Connecticut	791,253										791,253.00
Delaware	609,375							342,885.25	171,442.62	34.4	437,932.38
Florida	1,655,723				674,677.71	337,338.85	23.8	218,968.11	109,484.05	8.8	1,208,900.10
Georgia	3,168,221							1,620,894.90	810,483.37	97.0	2,357,737.63
Idaho	1,531,162	168,613.79	100,455.06	32.1	1,142,944.41	671,939.02	107.5	64,241.67	38,442.21	6.0	720,325.71
Illinois	5,160,696				1,488,507.04	744,163.02	35.9	3,532,954.33	1,766,477.09	47.6	2,650,055.89
Indiana	3,087,613				2,567,510.92	1,283,715.72	84.9	2,211,644.45	1,101,783.85	53.1	702,113.43
Iowa	3,231,718	13,228.44	6,300.00	6.6	3,495,891.78	1,641,960.00	195.3	2,112,416.22	995,746.00	88.6	587,712.00
Kansas	3,317,054				99,511.62	49,755.81		932,265.31	466,132.54	159.7	2,801,165.65
Kentucky	2,304,143				1,648,933.15	804,884.09	110.4	1,693,936.82	811,064.07	70.2	688,194.84
Louisiana	1,776,939				602,942.39	301,471.17	21.0	1,262,230.77	631,115.34	46.5	844,352.49
Maine	1,090,167	68,317.53	34,158.76	1.4	1,560,212.03	780,105.94	48.9	182,016.40	91,008.19	3.3	184,894.11
Maryland	1,025,870										1,025,870.00
Massachusetts	1,741,877										1,741,877.00
Michigan	3,837,292	345,600.00	172,800.00	10.3	3,430,900.00	1,712,725.00	141.5	1,712,124.00	856,062.00	66.5	1,095,705.00
Minnesota	3,423,306	334,237.74	143,116.10	12.2	2,194,445.12	944,666.36	127.9	1,310,449.18	523,220.75	86.9	1,812,302.79
Mississippi	2,196,524										2,196,524.00
Missouri	3,800,856	1,013,357.18	506,678.54	190.6	2,242,800.09	1,121,399.92	110.4	1,466,689.62	733,344.70	67.3	1,439,432.84
Montana	2,560,449	306,840.91	171,800.17	106.3	1,241,502.23	695,117.00	119.8	125,245.36	70,124.85	.3	1,623,406.98
Nebraska	2,581,663	383,196.94	191,598.42	36.2	1,353,576.31	676,788.12	98.3	11,827.75	5,913.87	5.2	1,707,362.59
Nevada	1,595,501	121,853.40	105,488.47	55.4	646,152.31	559,374.04	55.1	288,079.30	249,390.25	40.8	681,248.24
New Hampshire	609,375				360,618.09	177,366.44	10.0	472,306.38	232,596.39	10.8	199,412.17
New Jersey	1,675,751				1,106,107.99	553,053.97	20.0	2,172,606.12	1,086,303.03	18.2	36,394.00
New Mexico	1,999,299				1,102,970.24	670,826.37	102.2	275,466.78	167,538.85	27.3	1,160,933.78
New York	6,150,106				5,539,155.47	2,759,800.00	115.9	2,515,750.00	1,221,000.00	35.2	2,169,306.00
North Carolina	2,938,657				1,077,661.89	538,830.86	172.6	140,029.76	70,014.87	25.9	2,329,811.27
North Dakota	1,960,162										1,960,162.00
Ohio	4,565,435				291,762.00	145,782.00	2.1	911,000.00	455,500.00	16.0	3,964,153.00
Oklahoma	2,947,521				580,140.72	304,863.88	14.0	1,277,345.11	671,244.76	48.1	1,971,412.36
Oregon	2,044,633				1,591,996.12	963,984.77	65.1	783,198.35	477,728.97	25.5	602,919.26
Pennsylvania	5,348,062	18,018.35	9,009.17	.6	1,563,645.80	781,822.85	27.1	4,522,062.88	2,260,776.46	58.8	2,296,453.52
Rhode Island	609,375										609,375.00
South Carolina	1,692,896										1,692,896.00
South Dakota	2,036,775				513,132.07	281,244.11	35.2	67,987.31	37,277.38	9.9	1,718,253.51
Tennessee	2,638,159				819,471.58	409,735.76	37.9	453,822.83	226,911.40	17.8	2,001,511.84
Texas	7,777,504				4,189,074.28	2,065,622.41	245.6	2,604,651.30	1,292,788.32	132.2	4,419,093.27
Utah	1,410,752	108,747.96	78,516.02	9.4	664,328.43	479,645.07	54.4	41,334.09	29,843.21	3.2	822,747.70
Vermont	609,375	25,987.44	12,993.72	2.9	1,029,717.75	514,858.82	49.2	117,445.89	58,722.94	6.1	22,799.52
Virginia	2,278,475							613,964.86	306,982.40	23.6	1,971,492.60
Washington	1,949,957	304,340.27	160,400.00	8.9	1,275,216.03	672,000.00	50.1	468,888.97	247,293.19	1.5	870,263.81
West Virginia	1,356,793				476,603.05	238,301.50	25.4	113,032.96	56,516.49	6.8	1,061,975.01
Wisconsin	3,045,557	136,427.90	68,213.94	.2	1,108,393.34	542,186.38	56.7	625,709.00	292,619.54	28.0	2,142,537.14
Wyoming	1,559,444	428,050.79	263,631.00	79.5	1,942,219.94	1,196,192.00	177.2	142,529.48	60,636.00	17.9	38,985.00
District of Columbia	609,375							71,970.96	35,985.48	.5	573,389.52
Hawaii											
TOTALS	121,875,000	3,776,818.64	2,025,159.37	552.6	53,074,107.57	27,997,989.69	2,675.9	40,334,343.71	20,450,616.01	1,456.0	71,401,234.93

leaving a balance of $1,150,000 available for new construction. This amount must, of course, be matched with a like amount of state funds.

Louisiana

According to Office Engineer, J. A. Kinkead, Louisiana Highway Commission, information concerning 1936 expenditures is not available at the present time.

The United States Works Program, however, has appropriated $1,900,000 for highway projects and $3,200,000 for grade crossing work. In addition, regular Federal Aid to the extent of $850,000 is appropriated, a sum which is to be met by state funds.

Maine

While information concerning Maine's 1936 highway construction program is not available at this time, highway expenditures will be somewhat greater than last year because of the greater Federal appropriations. Maine has been allotted $1,090,167 of regular Federal Aid under the Hayden-Cartwright Act, and $1,676,799 for highways, roads and streets, and $1,426,861 for grade crossing elimination projects under the terms of the 1935 Emergency Relief Act.

Most of the projects in the regular Federal Aid program had been placed under contract by the end of last year, but in general the whole program is only one-half completed. Naturally the balance of this work will be carried on into 1936.

The Public Works Highway program has been started but the bulk of the work will be done in 1936. According to Office Engineer R. M. Page, Maine expects to have about $4,000,000 for construction purposes, and about $2,500,000 for maintenance work in 1936.

States that have engaged in diversion of highway revenues to purposes unrelated to highway construction are being called sharply to task by the motoring public from which these revenues are collected, according to reports made to the American Road Builders' Association by state and county officials in many sections of the country.

The "anti-diversion" provision that was written into the Hayden-Cartwright Act of 1934, served to check the tendency toward raiding highway revenues for a multiplicity of purposes, but the campaign to bring a total end to diversion of these funds will be given renewed impetus at the coming A.R.B.A. Convention in Cleveland, January 20-24.

Official figures, plus estimates made in cases where official figures are not available, show that diversion of highway revenues took a toll of approximately $200,000,000 from the road building program in 1934. Diversion for the year 1935 probably will total an equal amount.

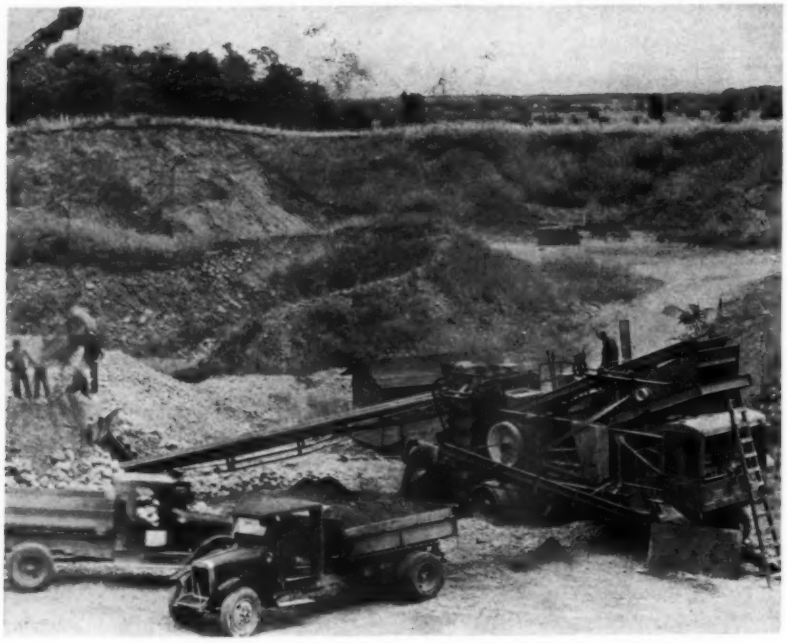
• *On a 1½-mile project joining the Albany-Jamestown highway in Kentucky, Ralph E. Mills Company. Frankfort, moved approximately 140,000 yards of rock in Euclid crawler wagons, pulled by Cletrac 80 Diesels.*

Maryland

More than $17,200,000 will be spent in Maryland during 1936 on highway improvement and construction. This money will be made available through both Federal and State sources. Federal Aid through the Hayden-Cartwright Bill will bring $1,000,000. Emergency relief, both new and carried over, brings $1,850,000. U. S. Public Works Program accounts for $3,800,000. The state gas tax brings in $6,000,000. Vehicle license fees provide almost $2,000,000. S. R. C. bonds account for the remainder of $2,568,000.

It is estimated that $10,200,000 will be used for highway construction; $3,250,000 for maintenance; and $3,900,000 for other purposes. Actual construction projects planned for the year include 18 miles of gravel or crushed stone highway at a cost of $177,900; 24 miles of oil treatment for roads at a cost of $370,000; 92 miles of high type paving at a cost of $7,100,000; and 20 new bridges at a total cost of $2,500,000. In addition to the above figures, a further sum of $3,200,000 will be available during the year for the construction of farm-to-market roads.

• *The construction of Farm-to-Market roads, if built under contract, should provide much work for contractors and their men. Here, Contractor Paul Barry of Richland, Pennsylvania, is engaged in widening a Pennsylvania farm road.*



● *All indications point to an increased mileage of gravel-surfaced roads this year. John Yerington operates this Austin-Western No. 100 portable crushing plant in his gravel pit near Niles, Michigan.*

Massachusetts

No exact figures can be given at this time concerning possible expenditures in 1936 for highway construction in Massachusetts. Federal Aid (Hayden-Cartwright Bill) has already appropriated $1,750,000 for use in 1936. In addition, all of the $3,250,000 provided by the Public Works Program will be available for highway work. Of the $4,200,000 appropriated by the government for grade crossing projects under the Public Works Program, about $3,450,000 is still unspent, and will be available in 1936.

Michigan

Inasmuch as the next regular session of the Michigan State Legislature will not convene until January 2, 1937, the highway department does not anticipate any change in its income from state sources for 1936 over the year just closing. The department has no state construction program as state funds are available only to match the regular Federal Aid appropriations.

Michigan's allocation from that appropriation, together with its matched funds, gives it a regular Federal Aid program of $7,674,000 for the fiscal year ending June 30, 1936, according to H. C. Coons, Deputy Commissioner-Chief Engineer. The highway department now has $5,624,759 of this program under contract, of which approximately $2,000,000 has been earned in 1935, leaving $5,674,000 of actual construction to be performed after January 1, 1936.

Michigan's allocation of U. S. Works Program funds is $13,066,611, of which amount $6,301,414 is for roads and $6,765,197 for grade crossing elimination. At this time $9,893,135 of this program is under contract, of which approximately $1,750,000 has been earned in 1935 and, in this case, $11,316,611 will be expended in 1936. Assuming that all current Federal Aid funds will be expended in 1936, Michigan has a potential expenditure of $16,990,611 in those programs for next year.

It is not known, of course, what action, if any, the next Congress will take in the matter of further appropriations for highway work. The next regular Federal Aid appropriation will probably be available July 1, 1936, and it is reasonable to assume also that approximately $2,000,000 of this program may be expended next year after the fund is available.

Michigan still has some National Recovery funds to earn, but the amount is negligible.

In addition to its regular construction work as above indicated, the department is expected to supervise the expenditure of $5,000,000 or $6,000,000 of WPA funds on the betterment of some trunk lines and the grading of some projects on new locations.

Minnesota

A large increase in funds available in 1936 for highway work is expected in Minnesota. Altogether $33,600,000 will be spent during the year—$20,000,000 for construction, $6,600,000 for maintenance, and $7,000,000 for miscellaneous purposes. Eleven hundred miles of grading work is planned in which 35,000,000 yards of material will be moved at a cost of $6,000,000. Seven hundred miles of gravel or crushed stone roads are scheduled at a cost of $2,000,000. 153 miles of high type paving will cost $4,000,000. An extensive bridge construction program is planned with 256 bridges to be built at an expenditure of $6,000,000. In addition to the above figures, $2,000,000 will be used for various miscellaneous jobs, and another $2,000,000 will be available for work awarded in 1935. Highway funds in Minnesota for 1936 will be provided from several important sources—$5,300,000 from the regular Federal Aid (Hayden-Cartwright Bill); $300,000 carried over from Emergency Relief funds; $7,800,000 from Public Works funds; $7,000,000 from state gas tax; $7,000,000 from vehicle license fees; and $6,200,000 from state bonds. The 1936 program is one of the most extensive and complete in the history of the state.

Mississippi

Approximately $17,525,000 is expected to be available for highways in Mississippi during 1936. The proposed program calls for an expenditure 40 per cent greater than that required in 1935.

According to information received from the State Highway Department highway funds will be made available from the following sources: regular Federal Aid, $4,400,000; 1935 Emergency Relief and Appropriation Act, $3,000,000; state gas tax, $3,900,000; vehicle license fees, $185,000; and from

Although New York's income from gasoline tax, imposed to finance the construction of highways, is estimated at more than $60,000,000 for 1935, plus an estimated $44,000,000 from registration fees, with sufficient Federal Aid funds to bring the total available for roads nearly to $112,000,000, less than half that total will be used for all roads, state and local, according to the American Petroleum Institute. The rest is diverted to general expenses, a situation which puts motor vehicle owners, who constitute less than one-sixth of the population, in the position of paying one-half or more of the state's total tax bill.

A proposed $46,000,000 road paving program is receiving consideration in Mississippi. The plan calls for a PWA loan and grant of $36,000,000, of which $19,800,000 would be a loan, the repayment of which would be guaranteed by the pledging of state gas tax funds. With $10,000,000 of Federal Aid funds available, the total amount to be used for such an extensive program would amount to $46,000,000. The program calls for the immediate paving of all main U. S. highways, and certain other important state highways.

Short Term State Notes approximately $6,040,000.

Of the total funds available, construction requirements will take $14,600,000, maintenance work and machinery for same will require $2,500,000, and other expenses such as salaries, rents, will need $425,000.

The tentative 1936 highway construction program includes: 440 miles of grading for $4,400,000 involving 9,000,000 yards of excavation; 300 miles of high type paving for $6,000,000 requiring 1,200,000 tons of materials; 200 miles of low type paving including gravel base for $2,000,000 requiring 640,000 tons of material; and bridges and culverts at an estimated cost of $2,200,000. Approximately 3,000,000 yards of excavation work involved in contracts awarded in 1935 or previously will be carried over into 1936. The amount to be earned on these contracts is estimated at $900,000.

At the time the above forecast was submitted the Mississippi Legislature was in special session and giving consideration to a road program. It is entirely likely that no definite program will be established until the new administration, which came into office in January, has had an opportunity to make one.

Missouri

Because Missouri's 1936 construction program has not yet been definitely established, Chief Engineer T. H. Cutler is unable to furnish more than a brief outline of the highway situation at the present time. It is expected that Missouri will have available approximately $21,000,000 for work in 1936. This is an increase of about $4,000,000 or 24 per cent over 1935 expenditures.

Of the above figure, $6,000,000 is the greater part of Missouri's allocation of funds under Works Progress Administration for grade crossing projects. Most of this money will be spent on the major system for high type improvement, a large percentage of which will be in the metropolitan areas.

In addition, the state has approximately $2,500,000 remaining of the Works Progress Administration Fund allocated for highway projects.

Approximately $2,500,000 will be available for construction out of the Highway Department's revenue from the state gasoline tax and vehicle license fees.

Other funds available include: regular Federal Aid, $5,500,000—$1,600,000 left over from the allotment available July 1, 1935, and remainder will be available after July 1, 1936.

Maintenance requirements will absorb approximately $4,500,000 of the Department's revenue.

Mr. Cutler states further that a large portion of the available funds other

(*Continued on Page 44*)

Highway Projects—U. S. Works Program

As of November 30, 1935

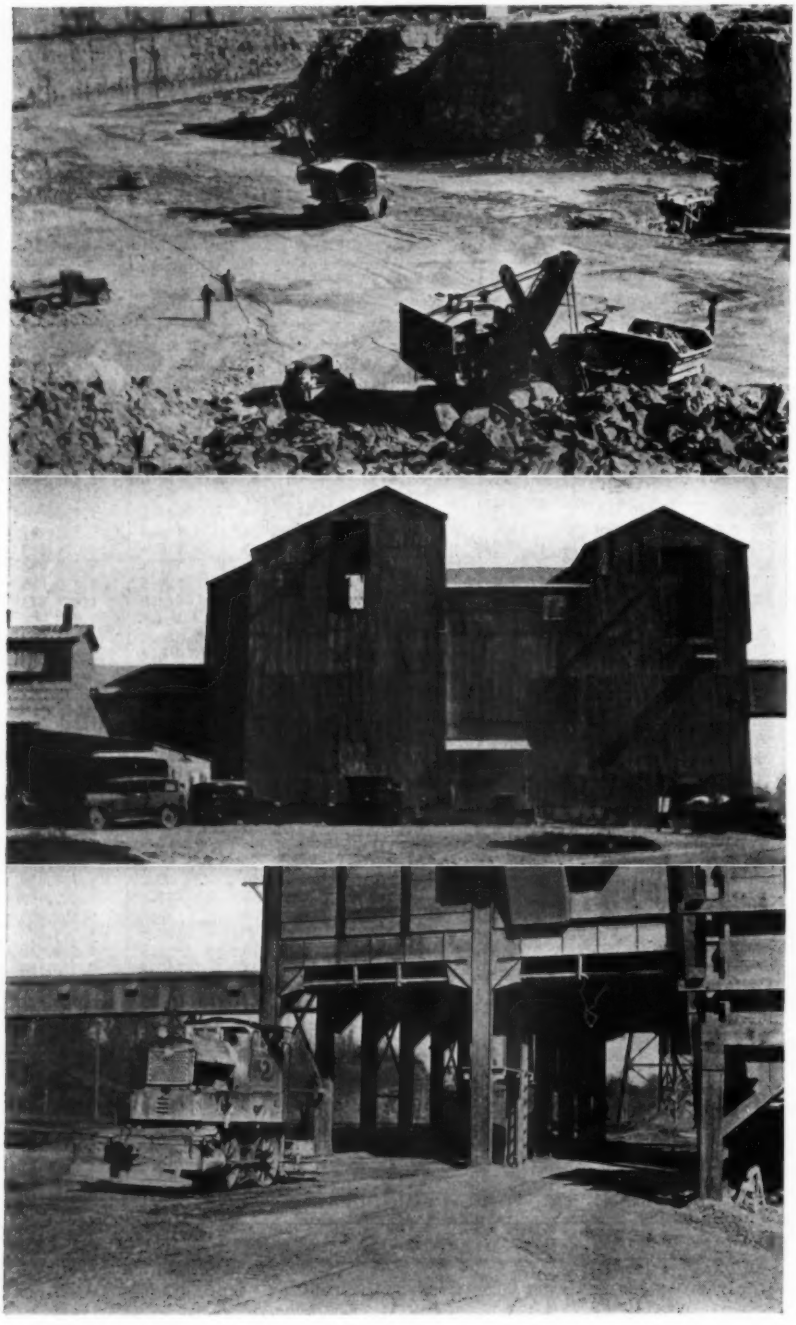
STATE	APPORTIONMENT	UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS
		Estimated Total Cost	Works Program Funds	Miles	Estimated Total Cost	Works Program Funds	Miles	
Alabama	$ 4,151,115	$ 281,438	$ 281,438	12.5	$ 2,611,603	$ 2,611,603	70.7	$ 1,258,075
Arizona	2,569,841	384,629	384,628	42.3	879,360	850,559	33.5	1,334,653
Arkansas	3,352,061	305,463	304,587	21.8	1,348,333	1,347,355	104.2	1,700,119
California	7,747,928				3,346,973	3,140,802	128.3	4,607,126
Colorado	3,395,263	185,953	185,953	10.1	605,614	605,614	34.2	2,603,696
Connecticut	1,418,709							1,418,709
Delaware	900,310				442,106	442,106	41.6	458,204
Florida	2,597,144	189,094	189,094	.9	565,447	565,447	19.6	1,842,602
Georgia	4,988,967				353,407	353,407	20.3	4,635,561
Idaho	2,222,747	181,581	180,861	16.5	290,539	275,334	27.1	1,766,552
Illinois	8,694,009	929,118	929,118	34.4	2,401,403	2,401,403	126.8	5,363,487
Indiana	4,941,255	214,413	214,413	3.0	2,448,713	2,448,713	136.4	2,278,129
Iowa	4,991,664	416,188	396,200	16.5	545,634	514,516	127.3	4,080,948
Kansas	4,994,975	276,219	276,219	7.5	1,863,110	1,862,110	229.6	2,856,646
Kentucky	3,726,271	228,593	202,349	27.9	1,722,954	1,669,050	238.2	1,854,873
Louisiana	2,890,429				1,332,857	1,026,991	150.3	1,863,438
Maine	1,676,799	332,279	332,279	17.3	708,898	708,898	29.3	635,622
Maryland	1,750,738				155,922	155,922	6.8	1,594,816
Massachusetts	3,262,885							3,262,885
Michigan	6,301,414	3,118,850	3,118,850	153.0	2,832,621	2,779,611	110.4	50,503
Minnesota	5,277,145	519,842	452,411	61.6	281,940	281,940	67.7	4,542,795
Mississippi	3,457,552	291,000	291,000	12.6	1,353,059	1,353,059	90.6	1,813,493
Missouri	6,012,652	586,632	586,632	135.5	2,417,637	2,417,637	522.8	3,008,383
Montana	3,676,416	292,904	292,904	17.4	1,321,542	1,321,542	88.9	2,061,970
Nebraska	3,870,739	339,342	339,342	27.9	1,223,132	1,223,132	127.0	2,308,265
Nevada	2,243,074	457,187	457,187	10.7	316,121	304,121	15.9	1,481,766
New Hampshire	945,225	196,152	194,182	5.5	7,454	7,454	.8	743,589
New Jersey	3,129,805	448,969	448,969	6.7	65,720	65,720	1.8	2,615,116
New Mexico	2,871,397	217,378	215,379	25.9	425,377	425,377	29.2	2,230,641
New York	11,046,377	1,983,638	1,960,887	16.6	3,041,270	3,026,270	25.5	6,059,220
North Carolina	4,720,173	523,847	523,847	42.0	463,470	463,470	26.2	3,732,856
North Dakota	2,867,245	252,537	252,537	45.0	154,005	154,005	17.2	2,390,427
Ohio	7,670,815	239,650	239,650	3.7	1,878,702	1,878,702	18.2	5,552,463
Oklahoma	4,580,670				1,010,842	1,010,792	107.6	3,569,878
Oregon	3,038,642	654,091	654,091	9.5	892,035	882,035	53.4	1,502,516
Pennsylvania	9,347,797				277,633	277,633	10.2	9,070,164
Rhode Island	989,208	38,695	38,695		61,555	61,555	3.6	888,958
South Carolina	2,702,012	262,376	262,376	23.0	179,465	179,465	19.6	2,260,171
South Dakota	2,976,454	299,666	299,666	108.0	436,452	436,452	106.6	2,232,851
Tennessee	4,192,460	292,862	292,862	14.5	279,476	279,476	15.7	3,620,121
Texas	11,989,350	1,006,509	975,953	79.0	4,256,438	4,146,944	401.4	6,866,454
Utah	2,067,154	197,613	194,268	10.6	295,098	270,970	35.1	1,601,915
Vermont	924,306	105,023	105,023	3.3	136,699	136,699	5.3	682,584
Virginia	3,652,667	446,711	446,711	378.5	668,782	668,782	143.9	2,537,174
Washington	3,026,161	579,985	579,985	19.5	871,710	820,876	45.4	1,625,300
West Virginia	2,231,412	282,277	282,277	17.7	467,989	457,592	20.3	1,491,542
Wisconsin	4,823,884	505,445	405,517	30.5	1,202,921	927,344	71.6	3,491,024
Wyoming	2,219,155				470,696	470,694	21.2	1,748,461
District of Columbia	949,496	276,255	276,255	2.4	447,761	439,425	3.7	233,816
Hawaii	926,033							926,033
TOTALS	195,000,000	18,340,404	18,064,595	1,471.3	49,360,475	48,148,604	3,731.0	128,356,590

Note: Projects completed—Michigan, 10.5 miles, cost $352,450—North Dakota, 9.2 miles, $70,277—South Dakota, 5.3 miles, $7,484. Total: 25 miles, $430,211.

Reducing Costs at Cape Girardeau Quarry

A summary of experiences in quarry procedure by Marquette Cement Manufacturing Company which have led to lower cost stone.

By E. M. Gould
QUARRY SUPERINTENDENT



IN 1924, the Marquette Cement Manufacturing Company started developing its own quarry at Cape Girardeau, Missouri. Prior to this date, stone for the cement mill was purchased from a local producer. The company owned several acres of very valuable stone land adjacent to the plant but separated by U. S. Highway 61. The upper four hundred feet of this stone is classified as the Plattin formation and the lower two hundred feet as the Joachin, both excellent for the manufacture of portland cement and commercial lime stone. The cleavage planes dip about three degrees to the northwest and when shot leave a very smooth floor.

This stone deposit was covered with an average of thirty feet of loess. About 35 acres were stripped hydraulically and the overburden pumped about one and one-half miles to fill in some low land. Enough rock has been uncovered to supply our requirements for the past 11 years and for several years to come before further stripping is necessary, even though a large commercial stone screening plant was added in 1925 to consume part of the quarry capacity available.

Changes to Larger-Diameter Bits Make Material Savings

The primary drilling is done with three Sanderson Cyclone No. 14 Senior well drills, traction type, using two-inch manila rope, and one Bucyrus-Armstrong Mod-

• *Top: The two electric 1¾-yard shovels operate in the second level. The big truck to the right in the foreground is being loaded by the shovel while the two small trucks to the left are hauling hand picked rip rap to the river for revetment work. Center: A view of the main crusher building with the shop and quarry office building at the left. Bottom: "Toonerville," a cross between a gasoline and steam locomotive, performs many useful duties around the plant.*

el 29 blast-hole drill on crawlers, using ¾-inch wire line. Each drill is powered by a 15-hp. electric motor.

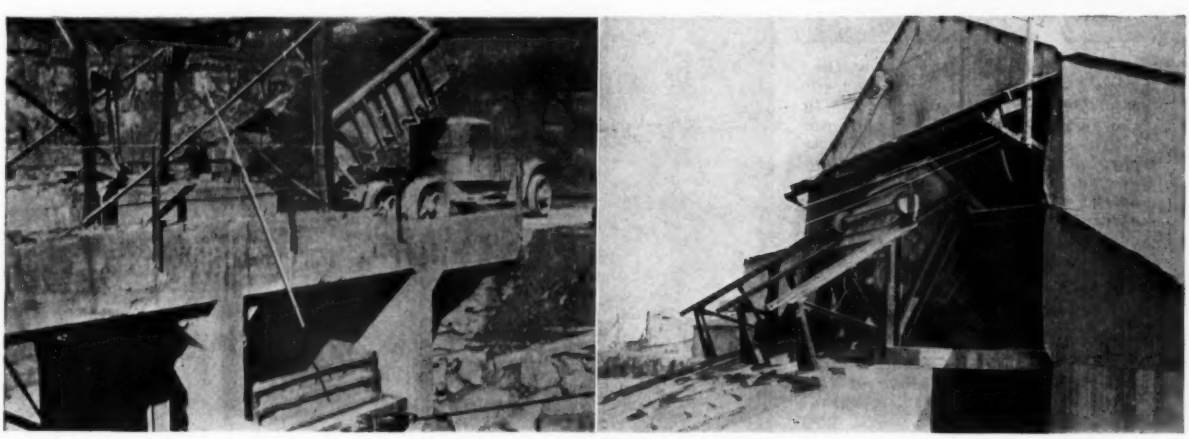
All four drills use 8-inch bits; the three Cyclone drills carry a 4½-inch x 18-foot drill stem and the Bucyrus-Armstrong 29 carries a 5-inch x 20-foot stem. The 29 is used in bailing out the holes before loading on account of the ease with which this machine can travel from hole to hole over the steep and rough surface on top of the rock bluff. It also drills about 20 per cent faster than the manila-rope machines due to the heavier tools and snappier motion of the wire line. Two thousand feet of hole is averaged per 200 feet of Plymouth 2-inch manila line and four thousand feet of hole is averaged from Leschen ¾-inch California special wire drill line.

• *The quarry is a beehive of activity when both the cement plant and the commercial stone plant are operating. Stone is loaded on both levels and hauled in 15-ton trucks to the skip dump in the foreground. Two well drills are churning away on the first level near the railroad-type shovel in the background.*

• *Left: At the first-level dump, ten yards of rock are dropped into the end-dump skip car below. Right: The loaded skip has been hauled to the top of the incline where an automatic device quickly tips and dumps the car.*

Up to 1931, the blast holes were drilled 6 inches in diameter and spaced 15 feet by 15 feet, the holes varying from 35 feet to 90 feet in depth according to the contour of the surface. The holes are drilled one foot below the floor level. In 1931 it was thought there might be a possibility of a saving in drilling cost by using a larger diameter blast hole. The idea was placed before George R. Watson, who was at that time Chief Engineer of the Armstrong Manufacturing Company,* Waterloo, Iowa. He made arrangements whereby we could get eight-inch bits dressed at their

*Editor's Note—George R. Watson is now manager of the Drill Division for Bucyrus-Erie Company, South Milwaukee, Wisconsin.



factory while we were experimenting, since the No. 6 Armstrong bit dresser we had at the time was too small for such large bits.

Several experimental holes were drilled and shots made. The results definitely indicated that by drilling eight-inch holes spaced 20x20 feet, a 35 per cent saving could be effected in labor cost alone. In addition the rock fracture was better than with the six-inch holes, and a very slight saving was indicated in the explosive costs.

To our surprise also, the drills showed an increase in footage per hour with the eight-inch holes over the six-inch holes. It was found that with 15-foot spacing of the six-inch holes, the back break fracture extended in places to the next line of new holes, this being governed to a great extent by the seams. This condition made drilling difficult at these points and held down the average footage per hour. But with the twenty-foot spacing of the eight-inch holes this trouble was eliminated. This same condition probably accounts for the slight saving in explosive cost per ton as evidently some of the gases escaped through these same fractures without doing their full amount of work.

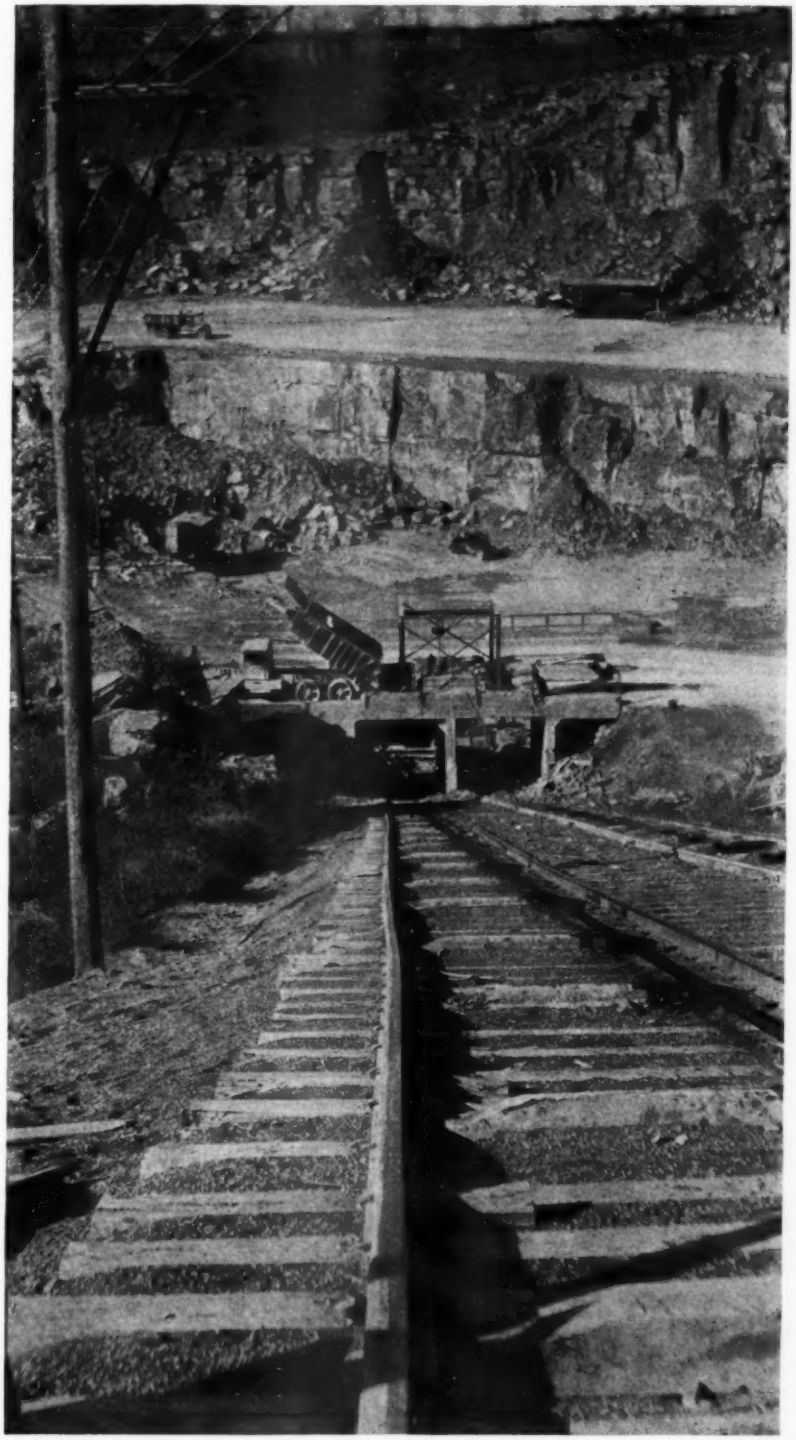
● *When the skip-car incline was put in several years ago one of the electric shovels handled the excavation in good shape.*

● *The working platform on the front of the Bucyrus-Armstrong all-steel blast-hole drill adds greatly to the operator's convenience and ease in carrying on drilling operations particularly when working on rough ground. The snappy drilling action of the wire rope equipped drill enables it to obtain greater footages each shift than is possible with any other type.*

Our experimental work showing such favorable results, we equipped the four drills with 8-inch bits and installed a No. 8 Armstrong bit dresser*. We found by careful tests that we can get

*Editor's Note—An improved model is now offered by Bucyrus-Erie Company—the Bucyrus-Armstrong No. 8 bit dresser to handle heavier bits. The company also manufactures the larger and more powerful No. 12 bit dresser.

● *At the quarry office we find, left to right: Fred Lindy, Office; Jess Todd, Clerk; E. M. Gould, Quarry Superintendent and author of this article; and W. C. Green, Assistant Quarry Superintendent.*



● *Looking down the skip-car incline from the crusher building. A recent blast of the second level has brought down considerable rock for the shovels to load.*

37 per cent more footage per hour from a machine-dressed bit than we can with a hand-dressed bit. Moreover the labor cost by the machine method is about one-half that by hand. Each bit drills about 50 feet of hole per dressing.

Primary Blasting Done with Quarry Gelatin

The primary blast holes are pocket loaded with 7x12-inch, 60 per cent, and the secondary block holes with 1⅛x8-inch, 30 per cent, quarry gelatin dynamite.

Experimental primary blasts have been tried with Liquid Oxygen with very good results but on account of the large investment necessary for an oxygen plant and since our requirements not being near the capacity of such a plant, this possibility was discarded as unprofitable.

Experimental blasts of practically all grades of dynamite have been made but the quarry gelatin shows the best economy in this rock.

Cordeau Bickford detonating fuse is used on the blast holes, and No. 6 electric blasting caps for the block holes. The quarry is situated alongside a heavily traveled highway and traffic must be flagged during blasting. For this reason it would be impracticable to use fuse as traffic would have to be held too long.

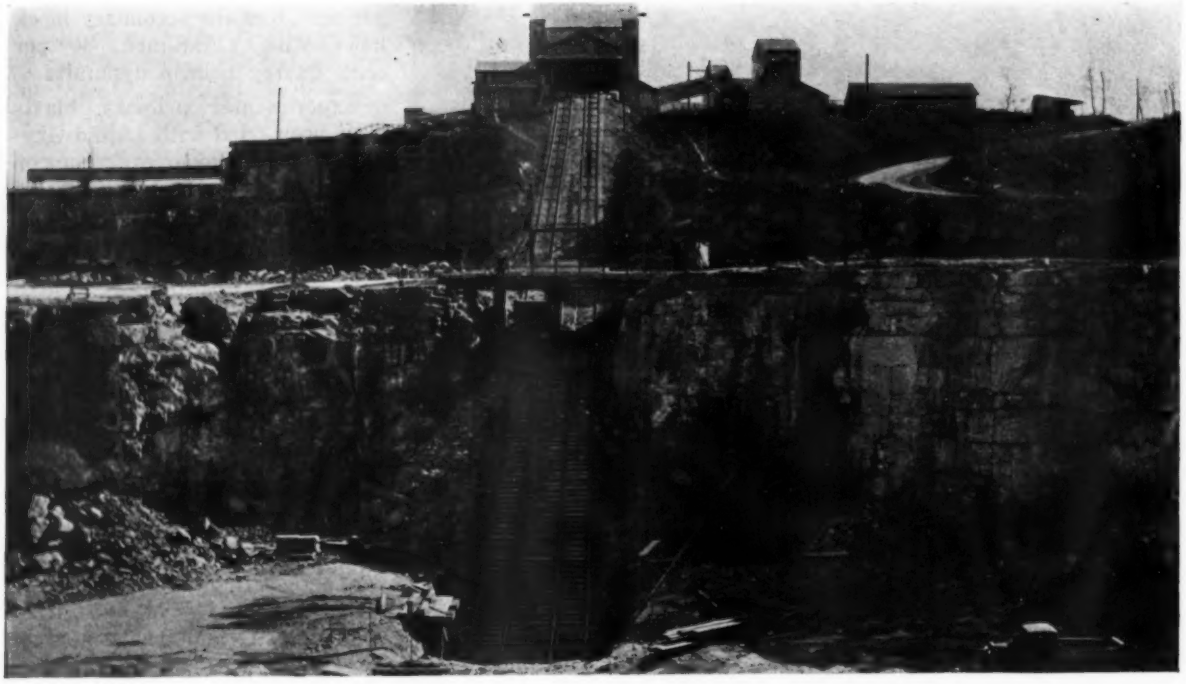
The secondary drilling is done with two Gardner Denver S-55 and one Ingersoll-Rand R-39 jack hammers using ⅞-inch hexagon drill steel.

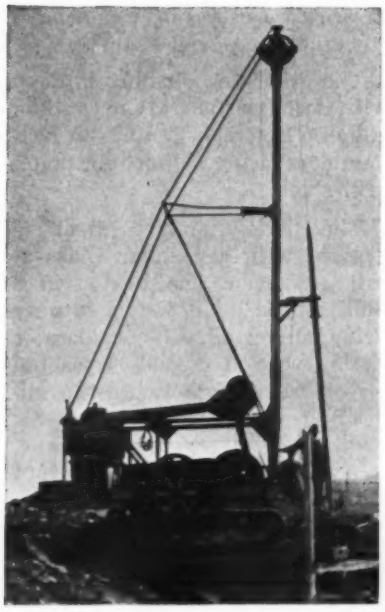
The jack hammer steel is dressed with a Sullivan Class A drill sharpener and heated in a Sullivan Class GF-3 steel furnace using Diesel oil. A considerable saving was effected by replacing an old coke forge with the oil-fired furnace.

Trucks Increase Quarry Output

Loading is done with one 3-yard Model 70 Standard shovel, equipped with crawler type mountings, and two 1¾-yard Model 37s, all Marions, electrically operated. However, only two of the three shovels are operated at any one time. A ½-yard Byers gas shovel is used, for the most part, to load spalls and dirt into 2½-ton trucks when producing rip-rap stone for river revetment work.

The stone is loaded into 15-ton Sterling six-wheel trucks carrying 10-yard Easton bodies equipped with Wood hydraulic hoists.





• *The long caterpillar-type mounting of the Bucyrus-Armstrong 29 makes it an easy matter to crib up the drill on uneven ground.*

When operating the second level, these trucks must carry their load up an incline 300 feet long to a transfer point and dump it into two Easton 12-yard end-dump skip cars which hoist the stone up a 20 degree incline to a 100-ton hopper. This long haul will be eliminated in the near future as the skip-car incline is being extended to the second level.

• *Looking up the skip-car incline from the lower level to the primary crusher building. The incline which originally ended at the first level is now being extended so that trucks operating on the second level will be able to dump without climbing out of the lower pit.*

Before the trucks were installed the haulage consisted of five 7-ton Whitcomb gasoline locomotives and 54 6-ton cars. Using this former system and even with all three shovels loading at the same time, a smaller tonnage was produced than is now obtained with only two shovels loading to trucks.

In comparing actual haulage costs between the two methods, there is only a small difference in favor of the trucks. But the flexibility of the truck-hauling system results in a very substantial saving in cost per ton over the former system. Truck haulage permits a steady flow of stone from the shovels to the crusher

• *Another view of the quarry showing the two levels.*

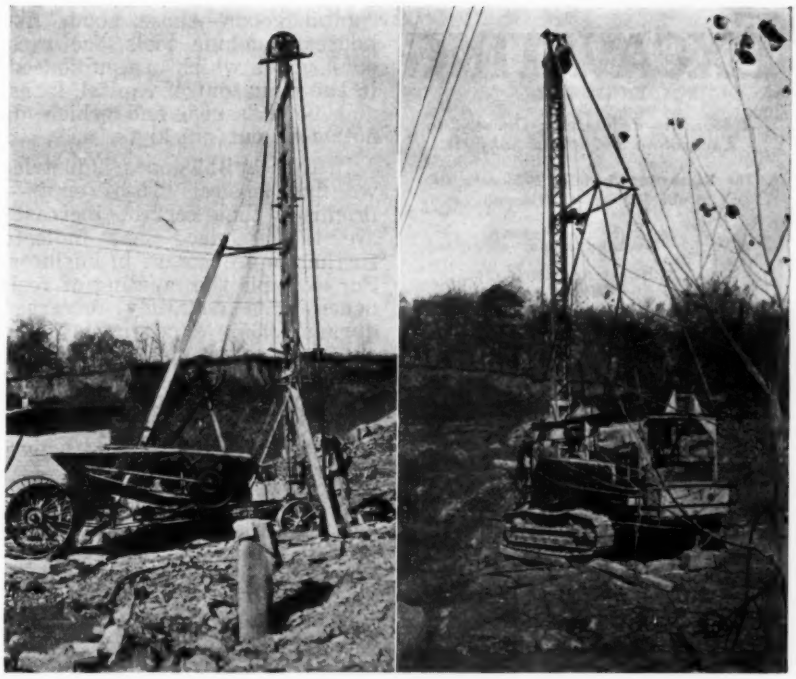
at all times with the result that the shovels load at least 30 per cent more stone now than before when loading 6-ton cars.

The trucks are equipped with Kelly Springfield solid tires, 40x 16-inch on the rear and 36x8-inch on the front wheels, which give on an average 8,000 miles or 16 months service. In order to get this service from tires it is necessary to keep the quarry floor clean at all times. This is done with a 5-ton Caterpillar tractor and bulldozer at a reasonable cost. Each truck is inspected, adjusted and lubricated at the end of each day's operation. By this method small repairs are noticed and taken care of before they get serious.

Rock Feeder Makes Saving

From the 100-ton rock bin into which the skip cars dump, the rock is fed to a 48x60-inch Traylor jaw crusher, driven by a 375-hp. Westinghouse motor, by a 48-inch Traylor rock feeder. This feeder replaces several men formerly required to feed the crusher and rarely does a rock wedge in the same despite the large pieces in the feed. A 20-ton chain fall, mounted on crawler above the crusher, is used to straighten out any rock that should lodge in the crusher and also to handle repairs to it. This crusher, set with a four-inch opening, discharges into a 48-inch Link Belt elevator at a rate of about 350 tons per hour.

The elevator discharges into a 100-ton stone bin mounted above two No. 7 Jumbo Williams hammer mills which reduce the stone to 2-inch minus. Magnetic clutches connect the mills to two 300-hp. General Electric motors.



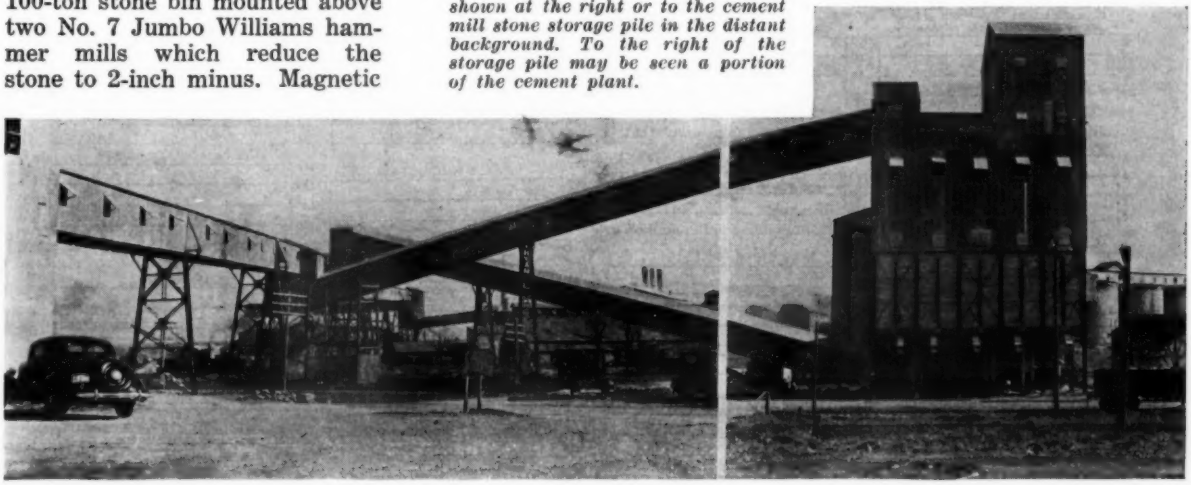
* *The old and new churn away on the top of the rock bluff. The widespread caterpillar-type mounting of the modern all-steel blast-hole drill adds greatly to its usefulness and utility, especially where the ground surface is rough and uneven.*

Bucket Elevator Handles Two Sizes of Stone Simultaneously

There is also a 4-foot x 2-foot double deck Niagara scalping screen, with 6-inch mesh screen cloth on the upper deck and 2-inch mesh screen cloth on the lower deck, located in front of the discharge of the Link Belt elevator. This screen is used when operating the commercial stone plant. The 6-inch plus stone is scalped out and discharged into an Allis-Chalmers No. 8 Gates Style gyratory crusher which produces a smaller percentage of fines than do the hammer mills. The 2x6-inch stone passing over the 2-inch deck of the scalping screen goes to the hammer mills. The 2-inch minus goes directly into a 48-inch Link Belt contin-

(*Continued on Page 61*)

* *A long belt conveyor carries crushed stone from the crusher building at the left over a railroad and a heavily traveled highway to either the commercial stone plant shown at the right or to the cement mill stone storage pile in the distant background. To the right of the storage pile may be seen a portion of the cement plant.*



EXCAVATING ENGINEER

A Monthly Publication Devoted to Excavating and Allied Subjects

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F. O. WYSE
Managing Editor

ARNOLD ANDREWS
Editor

E. T. OBENCHAIN
Assistant Editor

E. M. HEUSTON
Advertising Manager

The Business Situation

OF THE THREE YEARS which have passed since business began to drag itself out of depression, 1935 has proved to be by far the best twelve months. Our national prosperity depends, in the main, upon the volume of goods which we make and use. During 1935 we have increased both our production and our consumption. The main drawback is that this increase in consumption has been largely in the so-called "consumer goods" class. Our increase in business has been largely due to our increasing production and use of goods which are bought from current earnings and which wear out quickly. For lasting recovery we must also have an increase in production of capital goods—those goods like houses, machine tools, factories, etc.—goods which are purchased, in the main, out of capital, loans, and bond issues, and which do not wear out quickly.

In the capital goods industries we find several bright spots—promises that certain increases are taking place that indicate further improvement in business. For example the building of residences has definitely increased during 1935. According to one authority, approximately 125,000 new homes were built in 1935; this is more than double the 1934 volume, but it is still far below what might be considered a normal volume.

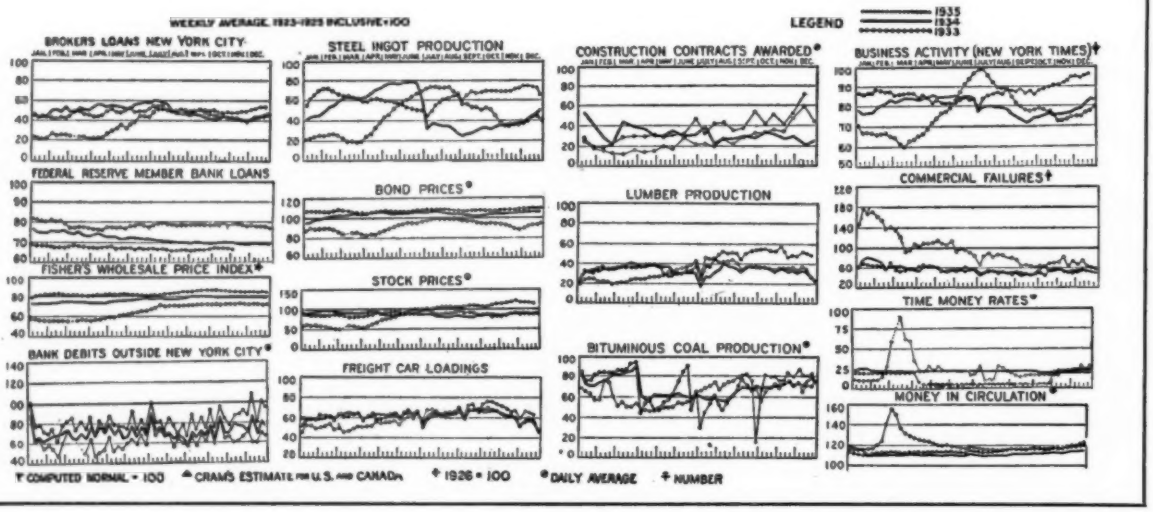
It seems quite reasonable to look forward to a still better year in 1936 than we enjoyed in 1935. The following is quoted from a recent statement by F. A. Merrick, President of Westinghouse Electric & Manufacturing Company, as a well worded summation: "The needs for renewals and replacements have become imperative in many lines and their fulfillment is providing the real pump-priming required for business recovery. Generally speaking the greater volume has brought business within the zone where profitable operation is possible. Through the indicated continuance of favorable factors, the year 1936 gives expectation of some greater volume over last year. In other words, the growing forces of recovery seem likely to over-balance the usual disturbing factors of a presidential election year."

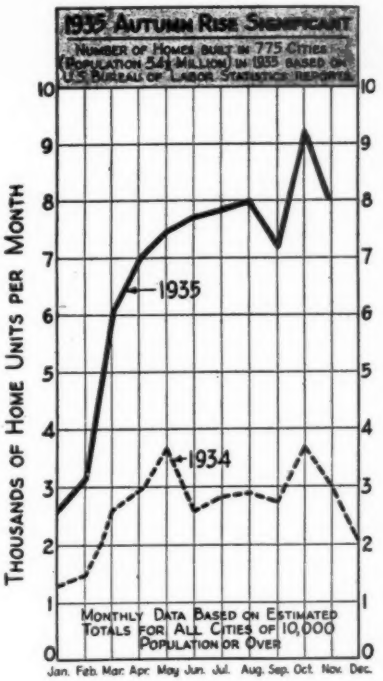
If the construction industry and those industries which manufacture durable goods are to play their part in the recovery of business, it is absolutely necessary that private finance play a larger part than it has in the last few years. Private capital must be invested in new projects, in an ever increasing volume. This can only come about by the creation of confidence among those who have capital to lend and among those business men who would enlarge their plants and extend their enterprises if they had full faith and confidence—confidence in the future of Federal credits, the future of our money, the permanence of our form of representative government, and the preservation of our economic system. Confidence of this nature must be generated before recovery can run its full course.

Increasing Activity in Construction Industry

THE CONSTRUCTION industry continues to record larger activity than was shown a year ago. For November, 1935, a contract total for all classes of construction in the amount of $188,115,000 was reported by F. W. Dodge Corporation in the 37 eastern states. This was an in-

WEEKLY BUSINESS INDICATORS




1935 AUTUMN RISE SIGNIFICANT
NUMBER OF HOMES BUILT IN 775 CITIES (POPULATION 54½ MILLION) IN 1935 BASED ON U.S. BUREAU OF LABOR STATISTICS REPORTS
THOUSANDS OF HOME UNITS PER MONTH
1935
1934
MONTHLY DATA BASED ON ESTIMATED TOTALS FOR ALL CITIES OF 10,000 POPULATION OR OVER
Jan. Feb. Mar. Apr. May Jun. Jul. Aug. Sep. Oct. Nov. Dec.

COURTESY—AMERICAN BUILDER AND BUILDING AGE

crease of about 68 per cent over the total of $111,691,500 reported for the same area in November, 1934. November's construction volume, however, failed to attain the level of $200,595,700 reported by the Dodge organization for October of this year.

November awards for residential building, as apart from other classes of construction, totaled $39,695,200 in the 37 eastern states; this was practically twice the total of $19,909,700 shown for November of 1934 and compares with $55,100,300 reported for October, 1935.

Nonresidential building undertaken during November amounted to $68,080,300 as against $39,439,500 for November, 1934, and $59,180,400 for October, 1935.

Heavy engineering types, generally classified as public works and utilities, undertaken during November in the 37 eastern states amounted to $80,339,500. This compares with $52,342,300 for November, 1934, and $86,315,000 for October, 1935.

For the eleven elapsed months of 1935 total construction of all types undertaken in the 37 states amounted to $1,580,408,400 as against $1,450,423,500 for the corresponding eleven months of 1934; this represents a gain over last year of 9 per cent.

The most striking improvement in construction has occurred in residential building. For this class of construction the total for the elapsed eleven months of 1935 amounted to $433,703,000 in the 37 eastern states as against only $234,289,600 for the corresponding eleven months of 1934—a gain of 85 per cent.

What the Highway Forecasts Promise

ANYONE who reads over the various state forecasts for 1936 highway construction as listed in this issue of *Excavating Engineer* cannot fail to note the splendid encouragement they give to the excavating industry. More than being just encouraging, these figures show a consistent trend upward, a definite basis for laying bigger and better plans for the coming year. No longer are we forced to tread warily, ready to retreat at the slightest sign of trouble — the mists have at last cleared and the way is apparently open and once more full of promise.

Looking over the reports from the forty-eight states, from the Atlantic to the Pacific, from the Canadian border to the Gulf of Mexico, we find one towering fact standing out—practically every state reports a substantial increase in the 1936 appropriation over 1935!

Starting with the Middle West farm states, we find that Illinois with $32,000,000 to spend promises a gain of 30%. Iowa, with $31,300,000, shows a gain of 50%. Missouri, with $21,000,000, reports a 24% gain. And Kansas, with $22,929,000 jingling in its jeans ready to be spent in 1936 for highway work, shows an actual gain of 75%!

In the South, Mississippi has 40% more appropriated this year than last. Florida, with $16,500,000 to spend, shows a 20% gain. And Alabama reports a 90% increase.

In the East, the gains are smaller, but nevertheless consistent and promising. Of the states whose figures are available, Rhode Island shows a 17% gain, New Hampshire a 10% gain, Delaware a 15% increase, and Maine a considerably larger appropriation than last year.

In the far west, Oregon finds itself with 19% more money to spend than in 1935, Washington with $12,600,000 has a 15% increase, Nevada a 10% gain, and Utah has a 25% better outlook.

And so they go—North Carolina showing a gain of 25%, Oklahoma 30%, Wisconsin 28%, Tennessee a 60% gain!

It requires no skill to interpret these percentage gains. As you read the reports, state after state, and note how many miles of new highways are to be constructed, how many millions of cubic yards of dirt are to be moved, the picture comes into focus. For this represents WORK—men planning and laboring, machines digging, supplies being bought and used, new equipment purchased.

With more money appropriated for highway construction in 1936 than for many years, there should be no doubt any longer in the minds of highway contractors of how the future stands.

Excavating Engineer is proud and happy to present these annual highway forecasts and to be able to show you in the most authentic and graphic way possible just what the coming year has in store for all of us. And because these forecasts would not be available without a great deal of special work on the part of the many state highway departments, *Excavating Engineer* takes this opportunity to thank the various state officials and engineers for their wholehearted cooperation.

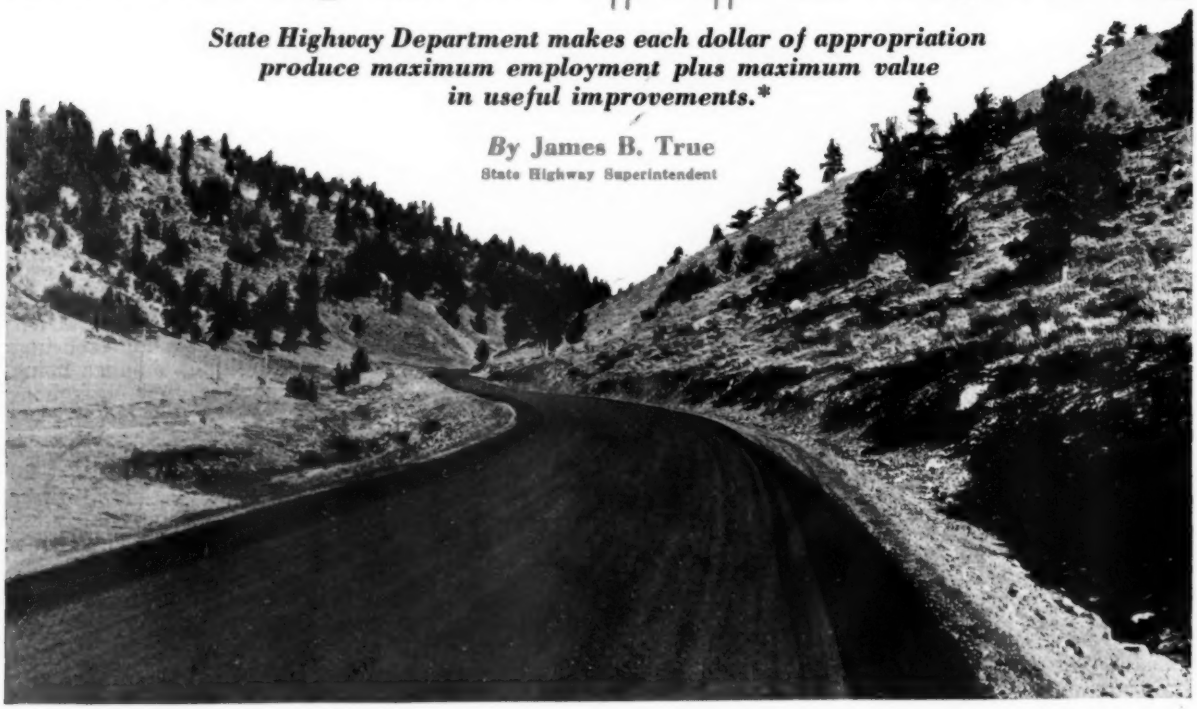
Our Cover

THROUGH the courtesy of the Bureau of Public Roads, our front cover illustration is reproduced from a portion of a large-scale map of Iowa prepared by that Bureau in cooperation with the U. S. Geological Survey. This map is made up in a set of 8 sheets, each 26x36 inches, on a scale of 4 miles to the inch and is believed to be the best of its kind yet produced. It shows in color the location and character of practically all transportation arteries such as Federal Aid and State Highway systems, important secondary highway connections, air lines and landing fields, railroads, pipe lines, navigable channels and canals, thus indicating on one map all the transportation facilities in the state.

Stretching Road $ $ in Wyoming

State Highway Department makes each dollar of appropriation produce maximum employment plus maximum value in useful improvements.*

By **James B. True**
State Highway Superintendent



● *Wyoming has done much in the past year to provide work for the unemployed through highway projects. Here is a view of U. S. Highway 30, nine miles east of Laramie, along Telephone Canyon—typical of the work that has been done.*

THE WYOMING State Highway Department has been endeavoring to do its part toward the relieving of unemployment through the building of roads. Funds have been provided by the Hayden-Cartwright Act of June 1934, and the Relief Emergency Appropriation Act of 1935.

For a period covering the past two and one-half years, 64.4 per cent of the funds expended came from the Federal Government. According to the law, no Federal funds are used for administration or maintenance, gasoline tax collections, or the State Highway Patrol. The State pays for these and has held expenses down so that for every $54.00 the Federal government furnishes, there is spent $80.00 for construction, $14.00 for maintenance, and $6.00 for overhead and miscellaneous.

Practically all construction work is done by contract, the State law requiring that awards be made to the lowest responsible bidder. Seventy-seven construction contracts have been awarded during 1935. This work called for the construction and reconstruction of 230 miles of grading and draining; 115 miles of surfacing; 498 miles of oiling, including seal coating; and 147 structures comprising 10 steel bridges, 1 concrete bridge, 2 overhead structures, 71 treated timber bridges and 63 reinforced concrete culverts. The cost of this work totals over four million dollars, nearly a million of which was spent for structures.

Maintenance costs are second in volume, being from 12 to 15 per cent.

Our construction work is mainly on our trunk or through highways. These are revenue producers through gasoline taxes and other "user fees" exacted by the State legislature. It has been estimated that 25 per cent is foreign traffic on these trunk highways and that they consume nearly 11,400,000 gallons of gasoline and pay about $450,000 tax. In 1934, the total receipts from gas tax was $1,764,000, 25 per cent of which, according to law, goes to the counties. The total gas tax for 1935 will likely reach two millions. Bearing in mind the value of these through highways, it has been our policy to provide them with a high standard of surface, alignment and grades.

Secondary Road System to be Improved

During the coming year, more work on secondary roads will be planned. We expect to cooperate with the Federal Highway Planning Board in making a comprehensive survey to determine which secondary roads should receive preference for construction.

This work on secondary roads fits in with the Federal requirements since a certain percentage of the funds provided by Congress must be expended on secondary highways. About 150 miles of secondary roads were already or have been placed on the

*1936 Highway Forecast for the State of Wyoming appears on page 60.

State Highway System during the past few years.

Another large division of work has been the construction of roads and streets through municipalities. The requirement has been to build up the streets forming connecting links with the State highways through cities to an adequate surface. To accomplish this work, some 80,000 square yards of portland cement concrete, 190,000 square yards of bituminous macadam, and 150,000 square yards of oil treated gravel were laid, in all equivalent to some 34 miles of highway 20 feet wide. The average cost of this work was $30,000 per mile, which is comparatively low in that many large bridges, curb and gutter, storm sewers and other incidental work was included.

At the beginning of the year 1935, the National Recovery funds had practically all been obligated on work under contract, and cutting down unemployment rolls with highway work was in danger of being terminated. There were regular Federal Aid funds appropriated but these must be matched with State funds, and Wyoming, in common with most of the other states, hesitated to put this work under contract until the policy of the Federal Government in expending the funds made available by the Emergency Relief Appropriation Act of 1935, was decided upon. However, due to the danger of these regulations and the new Emergency funds not being released until too late to provide employment during the construction season of 1935, the Commission finally decided to go ahead and match the Federal Aid money in order to avoid an acute unemployment situation.

● *Representative of the fine highways being constructed and improved in Wyoming with Federal Aid is this scenic road through Wind River Canyon.*

Over 3,250 Employed on Highway Work

In January of 1935, there were only 601 men employed on highway construction in addition to some 500 employed directly by the Highway Department on maintenance work and other activities. There were 50,000 man hours of employment provided in each of the months of January and February, but as a result of pursuing the policy described above, over three times as many man hours of employment were provided during the months of August and September, the sharp increase beginning in April and running through to August. This has resulted in an employment in August and September of over 3,250 men, including men employed in regular highway maintenance and other activities.

Thus during the past ten months, the Highway Department has done its share of relieving unemployment by keeping 2,050 men gainfully employed on needed, useful and permanent improvements.

It is the policy of this Department to continue construction work during the coming year, with the funds available, as efficiently and effectively as during the past two years, keeping in mind that this is an organization serving the people of the State. Our endeavor is to make every dollar stretch as far as possible regardless of whether it comes from taxes within the State or from Federal appropriations.

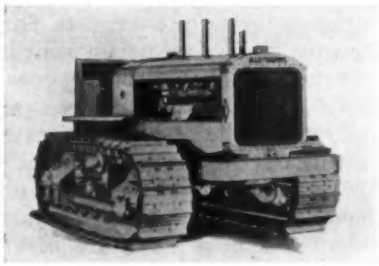
● *More than $4,000,000 was spent in 1935 in Wyoming for the building and surfacing of roads such as U. S. Highway 30 along the Palisades west of Green River.*

EQUIPMENT
You Ought to Know About

Allis-Chalmers Hauling Unit

THE NEW Model "K-T" hauling unit which moves six to eight-yard loads at speeds ranging from 2½ to 16 miles per hour has been recently announced by Allis-Chalmers, Milwaukee, Wisconsin. It is a single-unit outfit, consisting of trailer-type wagon and tractor, with four big, low-

pressure tires, and two smaller tires in front. A high arch provides clearance for the tractor to undercut, and to turn in its own tracks for quick, accurate spotting under dipper or grader. Braking, dumping, and winding operations are vacuum-controlled from the tractor dashboard, permitting one-man operation. Other units included in the announcement are: the new Models "L-O" and "L" oil and gas tractors with a new range of speeds and new controls;



the new Models "K-O" and "K" tractors with a top speed of 5.92 miles per hour, increased power, and new controls; the 14-foot power-controlled leaning frame Model 14, the 12-foot power-controlled Model 12, and the new Models 10 and 8 graders.

Mack Traffic-Type Trucks

MODERNLY - STYLED streamlined coupe cabs with integral all-metal roof construction feature the new and improved versions of Mack's CH and CJ Traffic Type trucks—the Mack cab-over-engine models. An outstanding development is the use of a roll-out powerplant which permits the withdrawal of the powerplant as a unit through the front, thereby providing greatly increased engine accessibility.

In keeping with modern design, the new cabs present a gracefully sloping front sheet and windshield, which together with a smooth radiator grille, permit a harmonious blending with streamline body types now so popular. Of all-metal construction, the roof is built integral with the cab, a construction that parallels the most advanced automobile body design and represents a distinct departure in motor truck cab construction.

A distinct innnovation in truck design, states the announcement, is the roll-out powerplant which permits the withdrawal of the engine, clutch, transmission and radiator as a unit, so that the removal or replacement of the powerplant can be accomplished by one man in about an hour and a half.

The front axle to back-of-cab dimension being now 24 inches as compared with the previous dimension of 30 inches. Retaining their one-third, two-thirds gross weight distribution, these chassis now have, in addition, shorter turning radius and shorter overall length, due to shorter wheelbases. Mechanical details of these trucks remain unchanged, the CH being powered by the Mack 4x5½, 108-horsepower engine; the CJ by the 4¼x 5½, 118-horsepower engine. Drive from the single-plate dry clutch is taken through a 4-speed transmission unit to a Mack dual reduction rear axle.

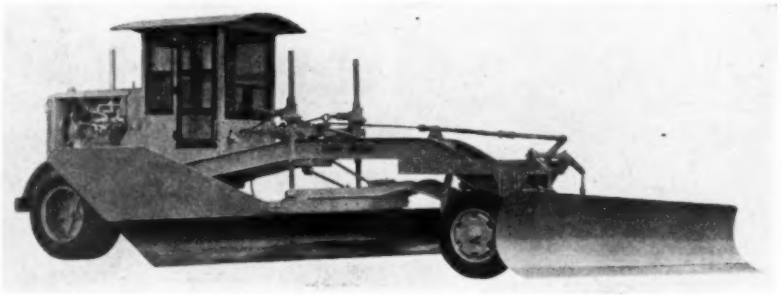
New Snow Plow and Blade Wing

A ONE-WAY snow plow and a winged blade extension for its three Auto Patrol models are announced by Caterpillar Tractor Co., Peoria, Illinois. These attachments are designed for moderate snow removal, to patrol highways during heavy storms, work mountain roads and clear city streets. The equipment clears a 10-foot swath, quickly opening one-way traffic in a single operation.

Accurate and fast blade adjustments, the announcement states, allow plow and blade to work close to the road, cleaning the snow right down to the surface to prevent ice formation. In many sections, this equipment will serve all snow removal requirements.

The plow is a self-contained unit that can be quickly attached to the front axles of the Caterpillar Diesel, No. 11 and No. 10 Auto Patrols. The power-control shaft provided for the scarifier operates the plow, which is 8½ feet long and cuts a swath 6½ feet wide. Height is 30 inches and maximum lift, 13 inches. Runners and spring suspension permit the plow to float over rough or uneven roads.

The extension and wing are attached to the right end of the Auto Patrol blade, and widen the plow cut to 10 feet. The wing pitch is adjusted by means of a telescoping shaft and hinges. Height including blade is 4½



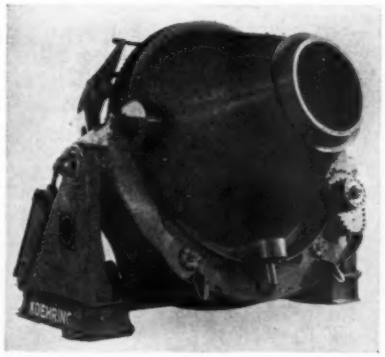
feet. The wing itself is 7 feet, 8 inches long. Both attachments are of heavy duty construction and are ruggedly reinforced. The new equipment will be offered in addition to the V-type snow plows which have been available for Caterpillar Auto Patrols in the past.

Koehring Develops New Units

KOEHRING COMPANY, Milwaukee, Wisconsin, has maintained progress during 1935 through the development of new equipment as well as improvements on the present machinery.

Outstanding is the 4-yard Concentric Zone Tilting Mixer developed for Grand Coulee. Eight of these machines will be pouring concrete for the dam construction. These mixers are charged and discharged through the same opening. The drums have only one opening, 38 inches in diameter, thereby utilizing a greater portion of the drums for mixing.

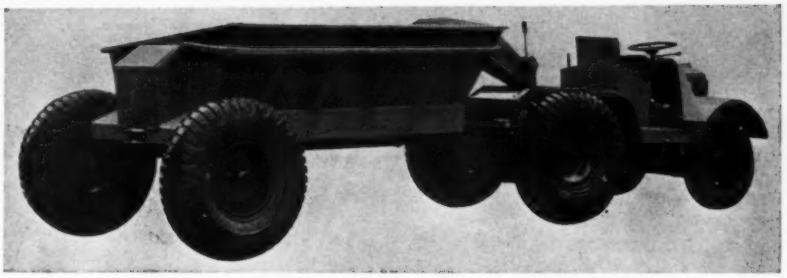
The mixing position of the drum is 15° above horizontal and the discharge position is 60° below horizontal. The cradle, drum and power unit are tilted as one unit which is suspended on pedestals on either side of the main frame. Tilting to the discharge position



and return to mixing position is accomplished by means of two pneumatic air rams. The drive is direct through enclosed reduction gear to the drum, thereby eliminating chain or belt drive and motor couplings. The design permits installation of batteries of 2, 3, or 4 mixers for charging from one proportioning plant.

This new type tilting mixer can also be had in the 2-yard size with the similar important features.

Koehring has made similar progress in the dirt-hauling field. The T-7 Trail-Dump has been added to the line of dirt-hauling equipment. This is a tractor-type



unit with a 7-yard heaped capacity wagon having a high travel speed of approximately 20 miles per hour. Important features are the "automatic hand" for closing the wagon doors, "non-raring" hitch, greater than 90° turning radius and mono-plate welded body construction. More than a year of proven performance in the field, states the manufacturer, has established this unit as an extremely economical and efficient tool for dirt-moving contractors.

The Koehring W55 Dumptor has been improved to give greater capacity, with longer wheel base and further perfected balance and stability. It is now furnished with vacuum-type booster brakes and lug-type tractor tires for positive traction.

Oil-Resisting Air Hose

AN AIR HOSE, designed especially to overcome the deteriorating effects of hot oil from air compressors, is announced by The Republic Rubber Company, Youngstown, Ohio. The tube is made from a compound similar to that used in oil-conducting hose, and according to the announcement, can actually be saturated with oil for long periods of time without affecting its serviceability.

In addition, the hose has great resistance to heat, high pressures, abrasion, the cutting effect of sharp rock and exposure to sun and weather. It is recommended for mines, quarries, rock industries, road work, contracting and general industrial use where service is exceptionally severe.

Great strength has been obtained, states the manufacturer, without impairing flexibility, by constructing the plies from a specially twisted cord which is thoroughly impregnated with a new tenacious rubber compound. This also increases the bursting and working pressures, and results in greater resistance to shock and abuse.

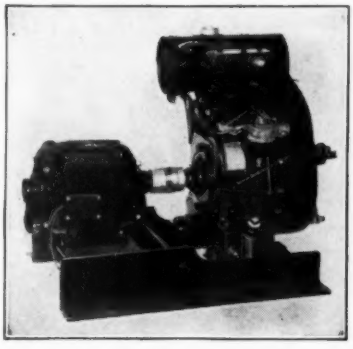
All construction details of the new hose have been so balanced and engineered as to result in strength without excess bulk or useless weight. Hose costs can be considerably reduced because of longer life and fewer replacements.

Complete information regarding the equipment mentioned on this page may be had by writing the manufacturers. We will appreciate your mentioning EXCAVATING ENGINEER.

Independent Lighting Plant

A LIGHT WEIGHT gas-electric lighting plant has recently been developed by The Moon Manufacturing Company, 114 No. Jefferson Street, Chicago, builders of portable lighting equipment for the construction industry.

This new model, known as the Type M, is available in two sizes, 1 KW and 1½-KW, 110-volt, D.C. The manufacturer states that these plants have been built to meet the demand for a small, light weight, compact generator



set that is rugged enough to stand up under the type of service required in construction work. The unit is 29″ long by 19″ wide—powered with an air-cooled gasoline engine of generous size—automatic in voltage regulation, consequently no rheostat is required.

These lighting plants are par-

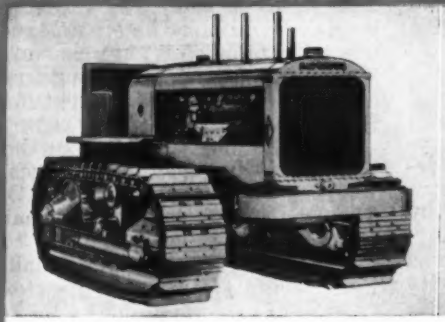
(Continued on Page 66)

PRESENTING THE

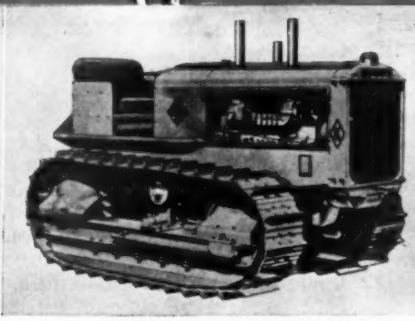
ALLIS-CHALMERS

LINE OF TRACTORS AND ROAD MACHINERY

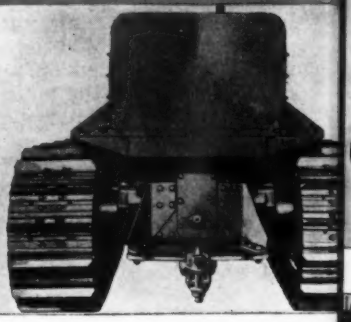
for 1936



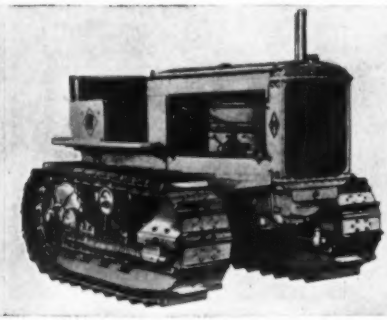
MODELS "L-O" AND "L" OIL & GAS TRACTORS



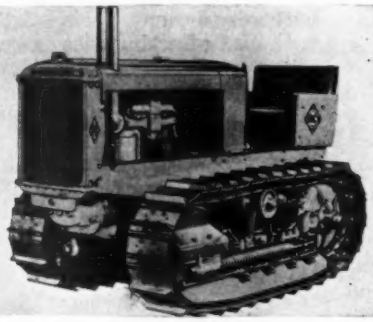
MODELS "K-O" AND "K" OIL & GAS TRACTORS



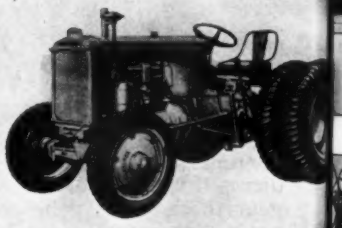
MODEL "WK" AND "WK-O"—WIDE TR



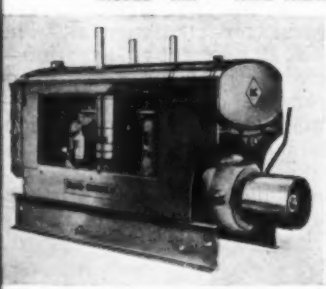
MODEL "WM"—WIDE TREAD



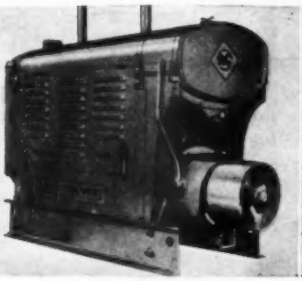
MODEL "M"—STANDARD TREAD



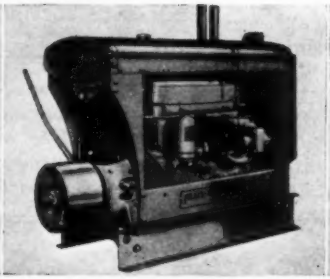
MODEL "IU" INDUSTRIAL TRACTOR



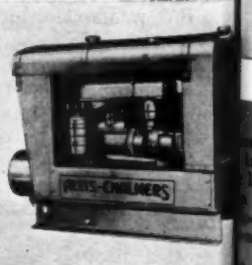
MODEL L-90 POWER UNIT



MODEL E-60 POWER UNIT

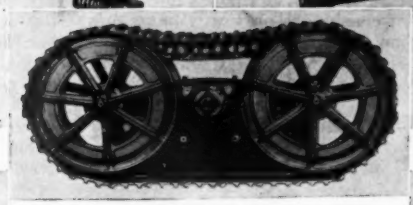


MODEL U-40 POWER UNIT

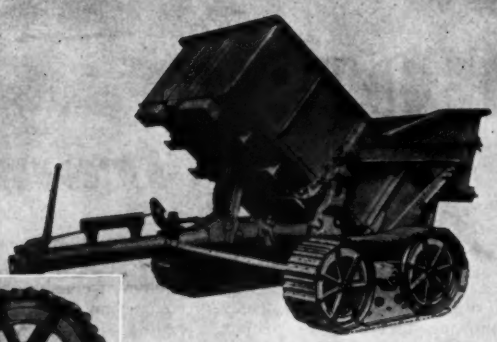


MODEL W-25 POWER U

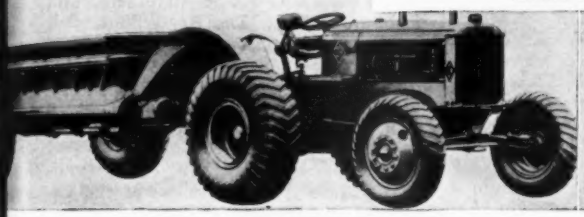
11 AND 15-YARD 2-WAY WAGON



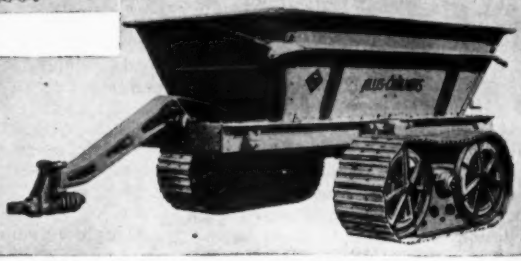
WAGON TRACKS



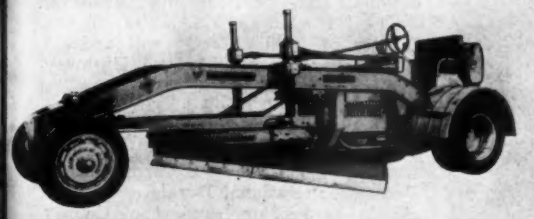
8-YARD GRAVITY DUMP WAGON



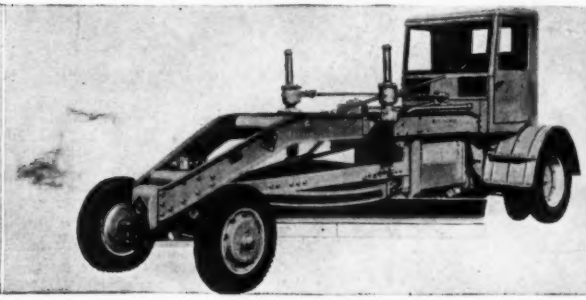
MODEL "K-T" HAULING UNIT



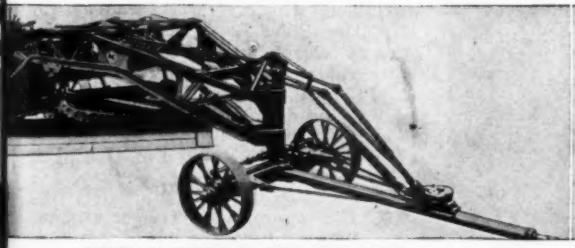
5½-6 AND 7-8 YARD WAGON



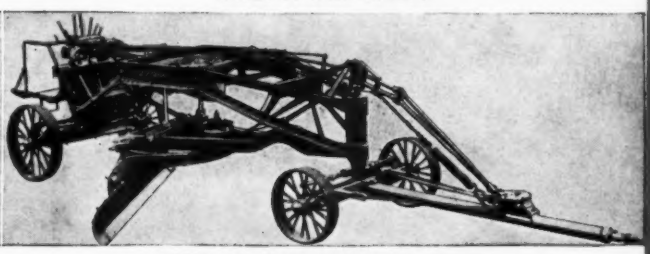
MODEL 42 SPEED PATROL



MODEL 54 SPEED PATROL



MODEL 14 POWER CONTROLLED GRADER



MODEL 12 POWER CONTROLLED GRADER

MODEL 10 HAND CONTROLLED GRADER

MODEL 8 HAND CONTROLLED GRADER

...e who are more interested in value and performance ...n tradition ... Allis-Chalmers presents its new and ...line for 1936. The cost-cutting Models "L" and "L-O" ... new range of speeds. A new model "K" Series with ...eeds forward—up to 5.92 miles per hour ... with 49.58 ...r H.P. ... and new, convenient controls. A new, Model "K-T" Hauling Unit ... hauls 6 to 8-yard loads from 2½ to 16 miles per hour. An improved line of blade graders and Speed Patrols. An entirely new line of power units. A line of Oil Tractors that operate on Diesel Fuel with the advantage of gasoline engine simplicity. Get more for your money in 1936—investigate the A-C line before you buy.

...LIS-CHALMERS TRACTOR DIVISION, MILWAUKEE, U.S.A.

SHOTS *from the Firing Line*

Work Continues on National Parkway

SPEEDY COMPLETION is assured of another link in the proposed Shenandoah-Great Smoky Mountains National Parkway, according to a recent announcement by Secretary of the Interior Harold L. Ickes, by the clearing of right of ways through the execution, by the State of North Carolina, of two more deeds conveying the lands involved.

Construction of the North Carolina part of the 500-mile National Highway, financed by PWA, was begun early in September, following the letting of the contract for the first link, 12½ miles long, south of the Virginia-North Carolina state line. Two more contracts, let on November 30, inaugurated the construction of 20 additional miles, connecting with the 12½-mile section. Two more sections were scheduled to be let before the first of the year. This will make a total of approximately 50 miles of continuous parkway under construction from the Virginia-North Carolina State boundary in a southwestern direction in North Carolina.

High-Lights of the 1936 Road Show

A NEW CHAPTER in road building will open with the 1936 Convention and Road Show of the American Road Builders' Association in Cleveland, January 20 to 24, when more than 20,000 highway officials, engineers, contractors, equipment manufacturers, material producers, and engineering educators will gather for the five-day convention and "Old Fashioned" Road Show.

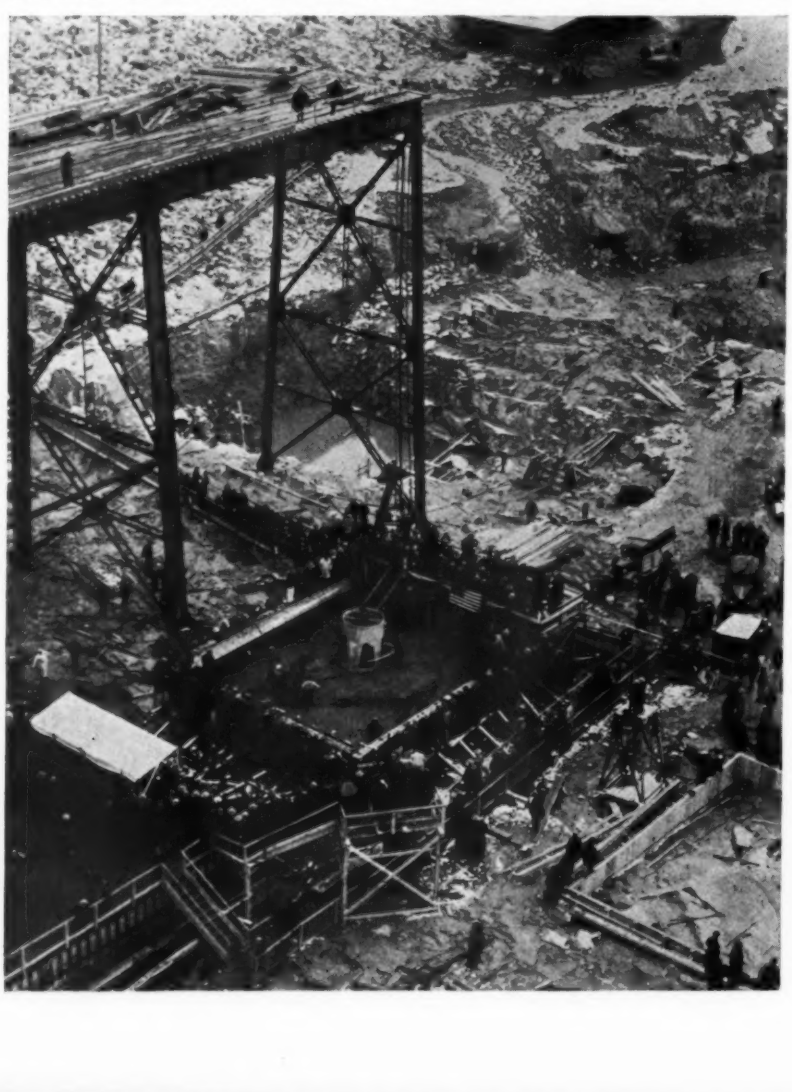
A rapid-action convention program is planned from the very first day, but there will be ample time for an important feature of the conclave that is not on the formal program—the meeting of old and new friends. There is no substitute for personal contacts, direct exchange of ideas, first-hand study of all new developments. Speakers, exhibitors and visitors at the Convention-Road Show will compose the "Who's Who" of the highway industry profession.

Both the Road Show and the Convention will open Monday, January 20, at the Cleveland Public Auditorium and Exhibition Hall. The Road Show will present in one vast array all types of highway equipment, while the convention will move swiftly into the subjects of vital interest to those engaged in designing, building and maintaining roads and streets.

Interspersed throughout the Convention will be special sessions of the various Divisions of the A.R.B.A. which include: County Highway Officials, City Officials, Highway Contractors, Manufacturers, Engineers and Officials, Educational, Pan-American and European.

Thos. H. MacDonald, Chief of the Bureau of Public Roads, will address the Convention on "Federal Highway Appropriations."

"Feeder Roads" will be subjected to a thorough examination and discussion by representatives of the National Grange, the American Farm Bureau Federation, National Rural Letter Carriers' Association, and the County Highway Officials' Division of the A.R.B.A. Closely allied with "Feeder Roads" is "Farm-to-Market-Roads," discussion on which will be lead by T. H. Cutler, Chief Engineer of Missouri. Also "Contract System vs. Day Labor" will receive plenty of attention with T. H. O'Connell, Arizona State Engineer, leading the discussion.



First Concrete Poured at Grand Coulee Dam

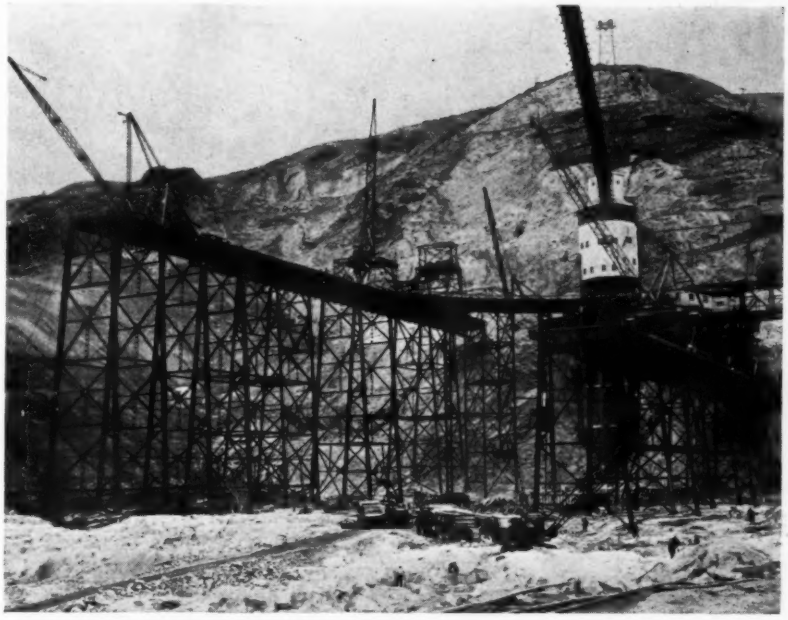
WITH appropriate ceremonies, the first bucket of concrete for the foundation of the gigantic Grand Coulee Dam was poured early in December. The illustration to the left shows the official party watching Governor Martin of the State of Washington operate the dumping lever of the big concrete bucket. This marks the start of what will be the world's largest concrete pouring operation, for, if plans are carried through to build the proposed high dam, over 11,000,000 yards of concrete will be required. The present contract contemplates the placement of approximately 4,200,000 yards of concrete.

The Mason - Walsh - Atkinson - Kier Company holds the contract for building the low dam. Some time ago the government engineers changed the

plans so that the dam foundations, now under construction, were increased to meet the requirements of carrying safely the proposed high dam and the enormous volume of water behind it.

The illustration to the right shows the west side concrete plant, and the trestles for transporting the concrete within the west side abutment area. Aggregates are brought across the Columbia River from the east side gravel plant by means of a belt conveyor, to the batching and mixing plant. Here, a battery of 4-yard mixers will operate continuously producing a steady flow of concrete which will be transported from the mixers to the forms by forty 4-yard bottom-dump buckets. The buckets will be transported five at a time on special cars designed by the contractor. Gantry cranes will swing the buckets from the cars to the forms and back again.

The contractors have been at work a little over fifteen months, during which time they have removed approximately 11,000,000 yards of dirt and rock from the foundation area on both sides of the river, and have erected the world's largest cofferdam on the west side, within which area excavation has been carried down to bed rock.



St. Louis Scene of Aggregate Associations' Conventions This Month

THE ANNUAL conventions of the National Crushed Stone Association, the National Sand & Gravel Association, the National Slag Association, and the National Ready-mixed Concrete Association will be held concurrently from January 27 to 30th in St. Louis with headquarters at the Jefferson Hotel.

The programs for the various associations which are being prepared for the meeting will be timely and of great interest to those attending. Problems of immediate interest to the members will be discussed by outstanding speakers. A machinery and equipment exposition is an added feature this year.

Shovel Comes Through Fire Undamaged

THE 42-B steam shovel owned by Christie, Hutchinson and Burton Company, Inc., of Birmingham, Alabama, at work on the Village Creek drainage project in Birmingham recently passed through a fire which fortunately did but slight damage to the shovel.

After a week-end shut down, the night watchman was preparing a fire in the boiler in preparation for Monday's work. The shovel was standing out about ten feet from the bank and was surrounded by water. The watchman was engaged in caring for the fire when suddenly flames shot up through and around the bottom of the shovel. He went to the door, looked out and found that the flames were spreading over the surface of the creek for quite a distance. Fortunately the shovel boom was pointed toward the bank and the watchman used this means to make his escape. The city fire department was called and quickly responded. The firemen put out the fire on the shovel but had trouble in subduing the fire on the surface of the water.

Investigation showed that a large quantity of kerosene had been spilled accidently, and finding its way into a branch of the creek, it was carried about a mile downstream to where the shovel was standing. It is thought that in stirring up the fire, live coals were dropped onto the kerosene, causing the conflagration.

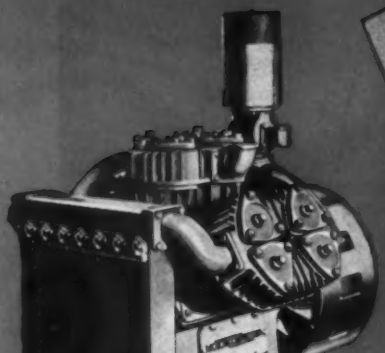
The illustration below shows Christie, Hutchinson and Burton Company, Incorporated, enlarging the cross section of one of the canals of the Village Creek drainage project which was financed by a PWA allotment of $1,490,000 to carry off flood waters and save the town from inundation.

Department of Commerce Establishes Unit for Business Research

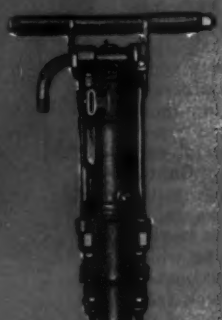
THE ESTABLISHMENT of a new unit in the Bureau of Foreign and Domestic Commerce, Department of Commerce, for research in the business problems of the construction industry

(*Continued on Page 42*)

MODERN EQUIPMENT fo



The two-stage, air-cooled Motorcompressor with built-in electric motor. Made in 20- to 50-hp. sizes, with piston displacements ranging from 113 to 310 cfm. An ideal compressor for many construction activities.

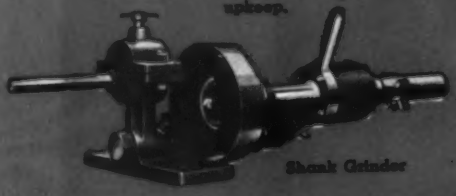


Jackhammer Drills — dry, wet, blower, and auger types. Numerous sizes — a machine for every operation.

Modernization is ce keynote of the day act pays to use only up th date machines. Ba

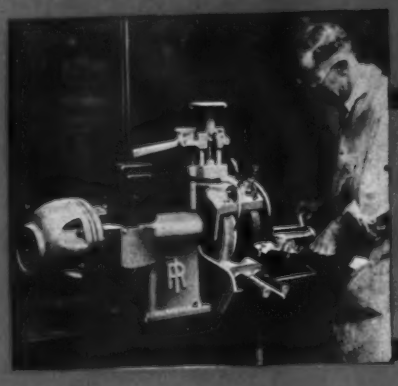
The modern constr 100 tion equipment sho uli on these pages is a al signed to reduce co lp and speed up work ost has been develop en out of our long exp ul

Jackbits stay sharp longer, resulting in greater footage and decreased drill maintenance. Steel handling costs and steel investment are reduced. Patented thread keeps the bit tight and makes it easily detachable, while maximum hammer blow is transmitted squarely to the cutting edge through full area of the end of the drill rod. Available in all sizes and all types. They can be reground from one to three times by means of the I-R Jackbit Grinder, which may be either air- or electric-driven. The I-R Shank Grinder squares the striking end of drill shank, reduces steel breakage and results in reduced drill upkeep.



Shank Grinder

For the permanent blacksmith shop the new IR-84 Drill Steel Sharpener and the new 27-F Oil Furnace are a combination that effectively cuts drilling costs. They make possible an increase in the forging rate, improvement in the quality of shanks and bits, and a reduction in drill steel costs.



Jackbit Grinder

Birmingham
Boston
Buffalo
Butte
Chicago
Cleveland
Dallas
Denver
Detroit
Duluth
El Paso
Knoxville
Los Angeles

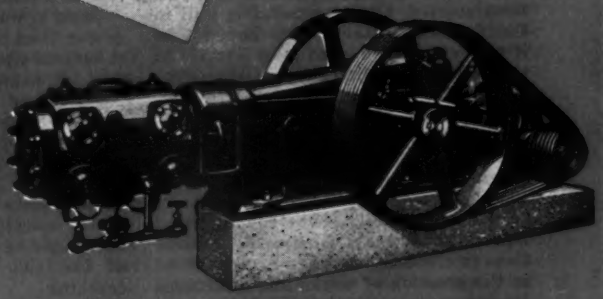
Ingers

11 BROADW

...ODERN CONSTRUCTION

...is ...ce in assisting con-
...day...ractors the world over
...up...th their problems.
Back of each product
...nstr...100% I-R service. Spe-
...sho...alists are available
...is ...all branch offices to
...e co...lp you select the
...vork...ost effective equip-
...lop...ent to meet your par-
...exp...ular conditions.

Stopehamer Air-Feed Drills for up-hole work. Hand or automatic rotation. Wet or dry type. Several sizes. Universally used.

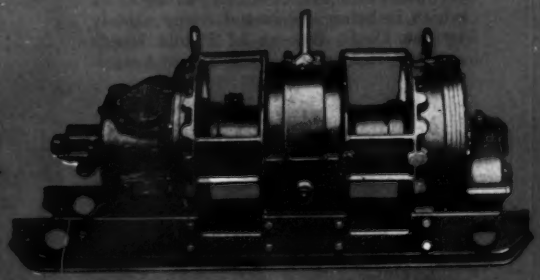


Single-stage Class ES Air Compressors. 20 to 125 hp.—pressures 5 to 150 lbs. Any type of drive. A highly efficient machine that will last a lifetime.

The Motorpump, combining pump and motor on one shaft, is furnished in sizes up to 1000 gpm., ¼ to 50 hp., and for heads to 500 feet. Sling yoke as shown may be used. The pump that is said to have a thousand uses. The portable air operated Sump Pump shown at the right is handy for dewatering winzes, sumps and low spots.

I-R Auto-Feed Drifter Drills eliminate hand cranking. Holes can be placed at better angles, permitting a marked saving in powder cost.

The most complete line of portable hoists in the world. "Utility" Air Hoists — single- and double-drum types up to 2500 lbs. pull. Electric "Tugger" Hoists — single- and double-drum types up to 100 hp.



The Explorer Diamond Drill is a light-weight, one-man unit for proving property from the surface or for checking building and dam foundations. It is driven by a standard four-cylinder built-in air motor, and can be mounted on any standard mine column.

...sd-Rand

...DW...W YORK CITY

Newark
Philadelphia
Picher
Pittsburgh
Salt Lake City
San Francisco
Scranton
Seattle
St. Louis
St. Paul
Tulsa
Washington, D. C.

190-S

Shots From the Firing Line— *Continued*

and related aspects of urban real property was announced December 20 by Secretary Roper, in response to recommendations of the industry and the Business Advisory Council.

Although this work in construction and real property economics has just been started, and at present is still in the formative stage, it is hoped that it may eventually be of large service to the construction industry in extending present knowledge in this important industry, which at the present time suffers more violent fluctuations in activity than any other industry of comparable magnitude or importance, according to the Commerce Department.

In their entirety, both contract and non-contract work, construction operations in the United States have resulted in the creation of works and structures having a total valuation averaging some 10 billion dollars annually over the past fifteen years and the employment in good times in construction operations and in the manufacture and distribution of materials and equipment of upwards of 5,000,000 workers. The industry, however, suffers from unusually violent fluctuations, and presents a large number of other serious economic problems which are widely recognized.

National Paving Brick Association Holds Convention in January

THE THIRTIETH ANNUAL meeting of the National Paving Brick Association will be held at Columbus, Ohio, January 29, 30 and 31 at the Deshler-Wallick Hotel. In addition to the business sessions of the Association, the program will consist of papers and discussions by prominent engineer and contractor users of paving brick. There will be a progress report of the technical study of de-aired paving brick which is being conducted cooperatively by the U. S. Bureau of Public Roads and the National Paving Brick Association.

Moving a Highway with Hose

A USE for hose believed to be without precedent is being made by the New Jersey State Highway Department. Along New Jersey Route No. 26, between New Brunswick and Trenton, the first eight miles of a forty-mile stretch of concrete roadway is being moved twelve feet to one side, to provide a safety island in the center of the present four-lane highway.

This island is being built in an effort to reduce the number of accidents, for during 1934 there were nearly 90 motor car deaths on this highway. More than twenty per cent of these were accidents between cars approaching from opposite directions, and more than forty-five per cent resulted between cars traveling in the same direction. New Jersey highway officials are hoping that the addition of the safety island will eliminate many of these accidents.

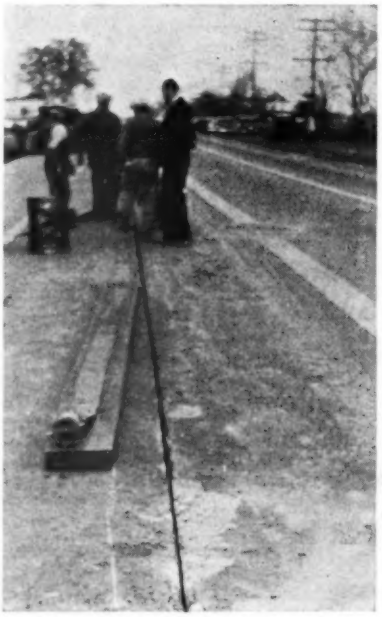
The present highway is made up of three concrete slabs, the center and west ones being 14½ feet wide and the east slab 10 feet wide. These are divided by white lines into four traffic lanes. The 14½-foot slab on the west edge of the highway is the one being moved. A new slab 10 feet wide will be built outside of the one moved, so that when finished the completed project will present a highway 25 feet wide on either side of a centre safety isle, 12 feet wide.

Since it was decided to move the road rather than build over it or break it up, it became a problem of moving the slabs without damage. Sigvald Johannesson, New Jersey State Highway Engineer, conceived the idea of accomplishing this with hose. Hydraulic jacks were first considered. This idea was abandoned, however, as it involved the cutting of deep pockets in each slab. Also it was highly questionable whether the pressure could be equalized along the length of the slab to prevent buckling or cracking.

The road is moved in approximately 500-foot lengths, which consist of fourteen slabs, each slab being 35 feet long. It is, therefore, necessary at each end of a 500-foot length to cut the slab at an expansion joint in preparing the road for moving, these fourteen slab units remaining intact during the entire process. After the road shoulder had been graded down to the proper level, the asphaltic joint filler in the longitudinal joint running lengthwise of the section, was removed by means of a steel blade drawn by a steam roller.

The removal of this joint filler left a crack about ½ inch wide into which was inserted five 100-foot lengths of three-inch flattened U. S. Hose, as shown in the illustration below. The hose had previously been soaked in water and treated with graphite. Air under pressure is forced into the hose and as it expands, it forces the entire 500-foot length of roadway to move approximately two inches.

The 3-inch hose is replaced with a



6-inch especially constructed hose and the process of expanding the hose with compressed air is then repeated, the slabs moving three inches with each inflation. After each inflation and deflation, proper blocking is placed behind the hose and the process repeated as shown in the illustration above. Each cycle consumes somewhat less than five minutes. The moving proceeds at a rate of approximately 800 feet of slabbing per day. Mud jack crews follow the moving gang and form a new permanent base for the transplanted highway by pumping a fluid mixture of top soil and cement through small holes previously drilled through the concrete.

Large Number of Awards Made by Bureau of Reclamation During December

ACCORDING to an announcement from the Bureau of Reclamation, the Bureau during December awarded thirty-nine contracts of a total value of $12,787,439 on reclamation construction projects.

"The month" stated Dr. Elwood Mead, Reclamation Commissioner, in his report, "was the busiest in the Bureau's history. In addition to the 39 large and small contracts let, bids were opened on four additional major construction jobs, advertisements for bids were issued on one other, and specifications upon which advertisements will be made shortly were prepared on 27 more."

The Bureau had 11,700 men at work on its projects on December 15, with prospects that this number would increase rapidly as construction is started on newly awarded contracts.

Some of the larger projects awarded during the month were:

A contract for the construction of tunnels Nos. 3, 4, 5, and 6 on the Alcova Canal, Casper-Alcova Reclama-

tion Project in Wyoming, was awarded December 11 to W. E. Callahan, Gunther & Shirley, Los Angeles, California, on their bid of $794,948.

A contract for the construction of the Seminoe Dam and Power Plant, Casper-Alcova Reclamation Project, was awarded December 13 to a firm composed of Morrison-Knudsen Company, Inc., Boise, Idaho, Utah Construction Company, Ogden, Utah, and Winston Bros. Company, Minneapolis, Minnesota, on their bid of $2,759,804. The Seminoe Dam will be a concrete arch type with a crest 540 feet long and 260 feet high. The power plant will contain three 14,000 horsepower units. The project is located on the North Platte River near Parko, Wyoming.

A contract for the construction of approximately 5 miles of the All-American Canal in Southern California was awarded December 14 to the George Pollock Company, Sacramento, California, on its bid of $700,987. This contract involves excavation of approximately 1,500,000 cubic yards.

A contract for the construction of the Imperial Dam and Desilting Works, a part of the All-American project, was awarded December 14 to a firm composed of the Morrison-Knudsen Company, The Utah Construction Company, and Winston Bros. Company, on their bid of $4,374,240. The Imperial Dam and Desilting Works, approximately 20 miles upstream from Yuma, Arizona, will serve a dual purpose, that of increasing the head at the point of diversion, and removing from the waters of the Colorado River their burden of mud. It is estimated that irrigators in the Imperial Valley of California will save $1,000,000 a year in the cost of maintaining their canal system upon the completion of the desilting works. Imperial Dam will be a concrete structure 2,990 feet long exclusive of a rock-fill section 470 feet long on the Arizona side of the river. It will be 31 feet high and will have an overflow weir 1,200 feet long of hollow concrete, "floating" type of construction supported on a silt foundation. The headworks of the All-American Canal on the California side of the dam will consist of four roller gates each 75 feet long and 23 feet high. Water will be diverted through these gates into the desilting works, which consists of six settling basins, each 269 feet wide and 769 feet long, arranged in pairs. Each pair of settling basins will handle a maximum flow of 2,000 second feet of water. The silt collected in the basins will be removed by 72 rotary-type scrapers, each 125 feet in diameter. The scrapers will force the silt into collecting trenches from which it will be flushed into the river below the dam through sluiceways 3,000 feet long. Included in the contract is the construction of a 1,500-foot section of All-American Canal which will be excavated after the diversion works are completed.

A contract for the construction of four wash siphon structures on the All-American Canal was awarded December 16 to the Frazier-Davis Construction Company, St. Louis, Missouri, on its bid of $489,527. The siphons will be constructed of concrete and rest on pilings.

A contract for the construction of Unity Dam on the Burnt River in Oregon was awarded December 16 to J. A. Terteling and Sons, Boise, Idaho, on their bid of $273,989. Unity Dam will be an earth-fill embankment 350 feet long and 78 feet high with the slopes protected with rip rap.

A contract for the construction of three tunnels on the Yakima Ridge Canal, which will serve the Roza Division of the Yakima Reclamation project in Washington, was awarded December 20 to the Morrison-Knudsen Company, Boise, Idaho, on its bid of $993,839. The tunnels will be horseshoe-shaped with a diameter of 16 feet 9 inches. Tunnel No. 1 will be 1,363 feet long, No. 2, 1,573 feet long, and No. 3, 9,813 feet long.

A contract for the construction of three tunnels on the Shoshone Canyon Conduit, which will serve the Heart Mountain Division of the Shoshone Reclamation project in Wyoming, was awarded December 21 to the Utah Construction Company, Ogden, Utah, on its bid of $614,509. The twelve-foot diameter tunnels range in length from 610 feet up to 7,190 feet.

A contract for the construction of Bull Lake Dam on the Riverton Reclamation project in Wyoming was awarded December 21 to the S. J. Groves and Sons Company, Minneapolis, Minnesota, on its bid of $653,-397. Bull Lake Dam will be constructed across the channel of Bull Lake Creek about 20 miles west of Pavillion, Wyoming. It will be an earthfill structure 3,400 feet long at the crest and 75 feet high.

A contract for supplying 375,000 barrels of cement to be used in the construction of Imperial Dam and Desilting Works was awarded December 26 to the Riverside Cement Company, the California Portland Cement Company, and the Southwestern Portland Cement Company, all of Los Angeles, on their joint bid of $1.57 net per barrel.

Department of Commerce to Conduct Business Census

A NATION-WIDE Census of 1935 construction operations was begun January 2 by the Bureau of the Census. Figures will be secured for the number of persons employed by contractors, man-hours of work in 1935, disbursements for salaries and wages, value of contracts and orders received during 1935, value of construction work performed, and expenditures for materials. In addition, information is to be obtained for the location of the business establishments that are regularly maintained by contractors, the legal form of organization (firm or corporation), and the kind of construction business in which they were engaged during 1935.

To augment the value of the construction statistics, some further information will be collected in detail at the request of the industry. Two sets of figures, for example, will be secured for persons employed. One will give an analysis of employees by broad occupational groups for a stated one-week pay period (that ending nearest October 26 has been designated). The other will present the total count of employees on the 15th of each month of 1935. As to work performed, the schedule form is arranged to show five separate types of construction, further classed as new construction or remodeling, repairs and maintenance. Private construction and public construction are also to be reported separately. With these breakdowns, it will be possible to present a statistical picture of construction activities in sufficient detail to be of real value to the industry.

The 1929 Construction Census was made, for the most part, by mail. For the 1935 Census, trained field men of the Bureau of the Census will make personal calls upon contracting establishments. These men will explain the report forms and assist the contractors to make their reports.

Headquarters for the Census of Business have been established in Philadelphia, with Fred A. Gosnell, Chief Statistician, in charge. Only sworn employees of the Bureau of the Census are permitted to examine the individual reports and then only for the purpose of compiling statistics. No access to information furnished is permitted under the law, not even to other Governmental agencies, and no information will be disclosed which would reveal any of the facts or figures in the individual reports.

Every effort will be made to complete the field canvass in three months. This will make it possible to issue the first results by July.

Public Lands For Sale

CERTAIN public lands in the Western States, capable of yielding metals or non-metallic ores, are now subject, with certain qualifications, to location and sale, according to an announcement made December 17 by the Secretary of the Interior.

Reopening of these lands for location was authorized in a recent Executive Order in which the President amended a previous order which withdrew all public lands from entry for purposes of classification.

The new order permits the sale or lease under certain sections of the Taylor Grazing Act of any public lands in the States of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah and Wyoming, which the Secretary of the Interior shall determine are not needed for any public purpose.

It includes all vacant and unappropriated public lands in the States listed above, valuable for either metalliferous or non-metalliferous deposits, and makes them subject to location under and pursuant to the United States mining laws, unless embraced in other withdrawals which prohibit or qualify the right to make locations thereon.

1936 Highway Forecast

(Continued from Page 23)

than those specifically marked for grade crossing projects will be spent on improving supplementary road and feeder roads to the state highway system. The regular Federal Aid funds, of course, will have to be spent on routes that have been made part of the Federal Aid highway system. The major portion of the remaining funds will be applied to the construction of, relatively speaking, low cost roads.

Montana

According to information received from the State Highway Commission, Montana's 1936 highway program will depend upon action taken by Congress in the present session. There are no state construction funds available at this time other than those to be used in matching Federal Aid.

The 1935 Emergency Relief Appropriation Act gave Montana $3,676,416 for highway construction, and $2,722,-327 for grade crossing elimination projects. Sixty per cent of these amounts were obligated by January 1. However, a large portion of the work under contract will necessarily be carried over until next spring, so that probably 75 per cent of the total amount allotted to this state will actually be earned in 1936. Montana expects to have available about $2,500,000 of regular Federal Aid, which necessarily will be matched by an equal amount of money from the state gas tax fund.

A detailed distribution of the highway construction funds is not available at this time but it is expected that a well rounded program of road grading, surfacing, and oiling, and bridge construction will be carried on. Maintenance work will probably require $1,-200,000 and administration and engineering costs will use up the balance of the State Highway Commission's revenue derived from gas tax and vehicle license fees.

Nebraska

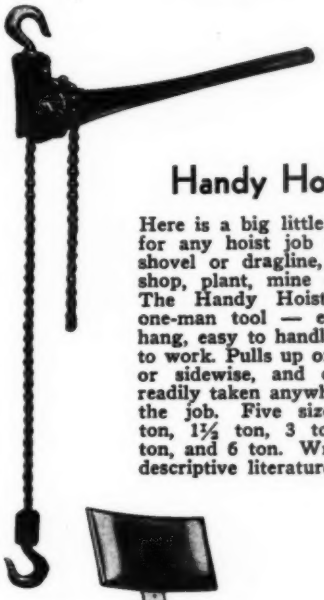
Plans for Nebraska's 1936 highway construction program are not far enough advanced at this time to per-

Grade Crossing Projects—U. S. Works Program

As of November 30, 1935

STATE	APPORTIONMENT	UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION				BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS
		Estimated Total Cost	Works Program Funds	NUMBER		Estimated Total Cost	Works Program Funds	NUMBER		
				Eliminated by Separation or Relocation	Protected By Signals or Otherwise			Eliminated by Separation or Relocation	Protected By Signals or Otherwise	
Alabama	$ 4,034,617	$ 596,130	$ 596,130	8		$ 1,977,742	$ 1,977,739	21		$ 1,460,748
Arizona	1,256,099	50,000	50,000	1						1,206,099
Arkansas	3,574,050	100,870	100,870	3		450,467	448,842	9		3,024,349
California	7,486,362	30,070	29,175			3,744,934	3,588,557	23		3,868,630
Colorado	2,631,567	236,145	236,145	7		114,450	114,450	2		2,280,971
Connecticut	1,712,684									1,712,684
Delaware	418,239									418,239
Florida	2,827,883	209,959	209,959	2		750,174	750,174	7		1,867,751
Georgia	4,895,949									4,895,949
Idaho	1,674,479	55,820	55,820	1		381,869	359,693	6		1,258,967
Illinois	10,307,184					1,187,449	1,187,449	16		9,119,735
Indiana	5,111,096	517,576	517,576	3		1,850,742	1,850,742	9		2,742,778
Iowa	5,600,679	579,844	552,700	9		325,954	310,800	8		4,737,179
Kansas	5,246,258					128,206	128,206	1		5,118,052
Kentucky	3,672,387					877,704	849,890	12		2,822,497
Louisiana	3,213,467									3,213,467
Maine	1,426,861	79,488	79,013	1		96,030	96,030	2		1,251,818
Maryland	2,061,751					505,309	505,309	4		1,556,442
Massachusetts	4,210,833					756,997	756,997	3		3,453,836
Michigan	6,765,197	1,447,575	1,447,575	16		1,992,277	1,992,277	20		3,325,345
Minnesota	5,395,441					380,086	380,086	14		5,015,355
Mississippi	3,241,475					795,730	795,730	16		2,445,745
Missouri	6,142,153					398,429	398,429	4		5,743,724
Montana	2,722,327	193,192	193,192	2		990,647	990,647	18		1,538,488
Nebraska	3,556,441	47,152	47,152	1		923,029	923,029	29		2,586,260
Nevada	887,260	322,457	322,457	7		56,287	56,287	1		508,515
New Hampshire	822,484									822,484
New Jersey	3,983,826									3,983,826
New Mexico	1,725,286					157,986	144,159	2		1,581,127
New York	13,577,189	512,966	507,510	3		2,751,960	2,653,460	4		10,416,219
North Carolina	4,823,958	258,286	258,286	1		525,181	525,181	7		4,040,491
North Dakota	3,207,473	39,335	39,335	2						3,168,138
Ohio	8,439,897					126,598	126,598			8,313,299
Oklahoma	5,004,711	139,826	139,826	2		739,959	739,959	14		4,124,926
Oregon	2,334,204					697,553	695,792	5		1,638,412
Pennsylvania	11,483,613	10,500	10,500			296,734	258,591	5		11,214,522
Rhode Island	699,691	275,115	275,115	3						424,576
South Carolina	3,059,956	95,982	95,982	2		429,675	429,675	10		2,534,298
South Dakota	3,249,086	48,782	48,782	2		51,774	51,774	1		3,148,530
Tennessee	3,903,979					287,070	287,070	5		3,616,909
Texas	10,855,982	66,713	66,713	3		387,341	387,341	9		10,401,928
Utah	1,230,763					158,359	158,359	1		1,072,404
Vermont	729,857	98,394	98,394			191,142	188,495	3		442,968
Virginia	3,774,287					209,501	209,501	6		3,564,786
Washington	3,095,041	112,262	112,262	2		952,828	950,931	8		2,031,848
West Virginia	2,677,937									2,677,937
Wisconsin	5,022,683	345,870	345,870	5		595,703	497,607	5		4,179,206
Wyoming	1,360,841	55,365	55,365	2						1,305,476
District of Columbia	410,804					166,697	166,697	2		244,107
Hawaii	453,703									453,703
TOTALS	196,000,000	6,525,674	6,491,704	88		27,410,573	26,932,553	312		162,575,743

A Money Saving Accessories



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Here is a big little helper for any hoist job around shovel or dragline, repair shop, plant, mine or pit. The Handy Hoist is a one-man tool — easy to hang, easy to handle, easy to work. Pulls up or down or sidewise, and can be readily taken anywhere on the job. Five sizes—¾ ton, 1½ ton, 3 ton, 4½ ton, and 6 ton. Write for descriptive literature.

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No matter how unusual your "push, pull, clamp, or straightening" problem may be, BECO Jack is the tool that gives you a safe, sure, and proved means of doing the job better. The drop-forged nuts, lever socket, ratchet and screw are heat-treated so that a welding heat will not damage the jack. Screw lengths — 10", 12", 14", 16", and 18". Capacity 35,000 lbs. Send for bulletin.

Wire Rope

Selected by the men who build your excavating and drilling machinery, Bucyrus-Erie rope has the special features that spell better performance. B-E wire rope has a uniform high quality, and comes in the right sizes, types, and construction for your exact needs. Send for wire rope bulletin.

Comfortable Seats

Avoid operator-fatigue and increase output — modernize your machines with BECO Seats. These seats are comfortable, provide insulation from vibration, are adjustable to the individual, and may be shifted from one machine to another. Descriptive bulletin sent upon request.

Blocks and Linings

BECO Blocks and BECO Linings take hold with a smooth, firm, accurate grip that means greater output for the machine and more confidence for the operator. Built for the gruelling demands of modern excavating. Write for details.

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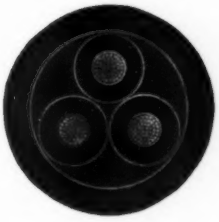
Bulldog wedge rope sockets never fail. The harder the pull . . . the tighter the grip! Attachment is easy and quick and directly in line with pull, eliminating costly kinks. Made in a dozen sizes and four different styles. Write for bulletin.



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Bucyrus-Erie Power Cable is —compact . . . flexible . . . long-lived . . . vulcanized to produce a non-porous rubber jacket, absolutely waterproof and highly resistant to oils and acids. Write for prices.

Links and Rings

BECO Links and Rings save you time and money. The Links permit quick repairs to broken chain; the Rings revolve, spreading wear evenly. Order today.

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mit a detailed statement to be made about them. However, according to the Department of Roads & Irrigation, it's expected that Nebraska will have available approximately $11,650,000, of which $8,450,000 will be used for new construction and administration expenses, and $3,200,000 for maintenance.

The above expenditure is based upon the receipt of funds from the following sources: regular Federal Aid, $1,700,000; Federal Relief (NIRA), $50,000; 1935 Emergency Relief and Appropriation Act, $3,700,000; state gas tax $5,700,000; and vehicle license fees and other sources $500,000.

Nevada

Complete details of Nevada's highway construction program for 1936 (the Highway Department's fiscal year ends June 30, 1936) are not available at this time. However, states E. W. Harris, Statistician, the major portion of Nevada's highway system makes use of the oiled gravel type of surface and hence most of the funds available for construction will be used in building roads of this type.

In general this year's construction program is approximately 10 per cent larger than it was during the previous year. The Highway Department's funds for the present fiscal year have been received from the following sources: regular Federal Aid, and including money for highway construction on Federal land, $2,000,000; the 1935 Emergency Relief and Appropriation Act, $3,000,000; from state gas tax, vehicle license fees and other sources $1,100,000.

New construction work requires $5,300,000, maintenance will use $700,000, and other expenses will require $100,000, all figures being approximate.

While the construction funds will be used mainly in oiled gravel types of roads, bridges and grade separation structures will use approximately $1,000,000 of that money.

● *Removing forms from this concrete bridge pier is quickly done by George W. Condon of Omaha, Neb., with his ¾-yard Bucyrus-Erie crane.*

New Hampshire

According to information from the Highway Department, New Hampshire expects to have approximately $6,860,000 available for highway work during 1936. This expenditure, as tentatively programmed now, will be 10 per cent larger than last year's.

● *The Hunlock's Creek Sand and Gravel Company of Nanticoke, Pa., hauls washed gravel to the storage piles in this 2-ton White Model 704 dump truck.*

Of the $565,027,000 collected in gasoline taxes in the states in 1934, $94,357,000 was diverted to purposes other than highways and $33,976,000 remained in the state treasuries at the end of the year, according to a study made by the American Association of State Highway officials.

New York had the worst record of the 48 states in the matter of diversion, $29,322,000 being used for other purposes. Ohio and Massachusetts diverted $10,215,000 and $10,000,000, respectively. Illinois, Texas and New Jersey follow in that order diverting $8,115,000, $7,887,000, and $4,056,000 respectively.

A list of the sums diverted from highways in each state follows:

Arizona	$ 302,000
Arkansas	260,000
Colorado	1,719,000
Florida	2,322,000
Georgia	2,386,000
Idaho	7,000
Illinois	8,115,000
Kansas	9,000
Louisiana	1,782,000
Maryland	426,000
Massachusetts	10,000,000
Michigan	21,000
Mississippi	386,000
Missouri	98,000
New Jersey	4,056,000
New York	29,322,000
North Carolina	706,000
Ohio	10,215,000
Oklahoma	3,181,000
Oregon	6,000
Pennsylvania	2,765,000
Rhode Island	306,000
South Dakota	1,907,000
Tennessee	1,994,000
Texas	7,887,000
Virginia	43,000
Washington	948,000
Wisconsin	3,163,000
Wyoming	25,000
Total	$94,357,000

He TIMED *his* FUSE *for* 100 YEARS

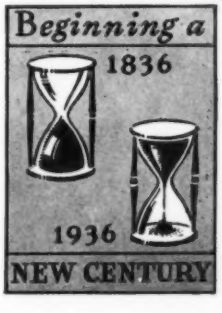
A century has passed since Wm. Bickford discovered that a simple twist of jute yarn could be made to hold a core of gun powder in a continuous, slow-burning train.

In this discovery he bridged a hundred years—perhaps an age, for during the century that has witnessed the greatest progress the world has ever known, this basic principle has remained unchanged.

Bickford Safety Fuse came to America in 1836. At first a crude, handmade product, its development throughout the years has been evidenced by closer standards, better materials, finer construction. Steady improvement rather than radical change bears witness to able thinking, careful planning one hundred years ago.

In 1936 we celebrate our Centennial—and dedicate ourselves to maintain these high standards, that Ensign-Bickford Safety Fuse may ever be dependable.

A product, like a person, is known by the company it keeps. During this year we shall show you the use of Ensign-Bickford Safety Fuse and Cordeau-Bickford Detonating Fuse by famous companies.



ENSIGN-BICKFORD
Safety Fuse

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Detonating Fuse

Simsbury, Connecticut, U. S. A.

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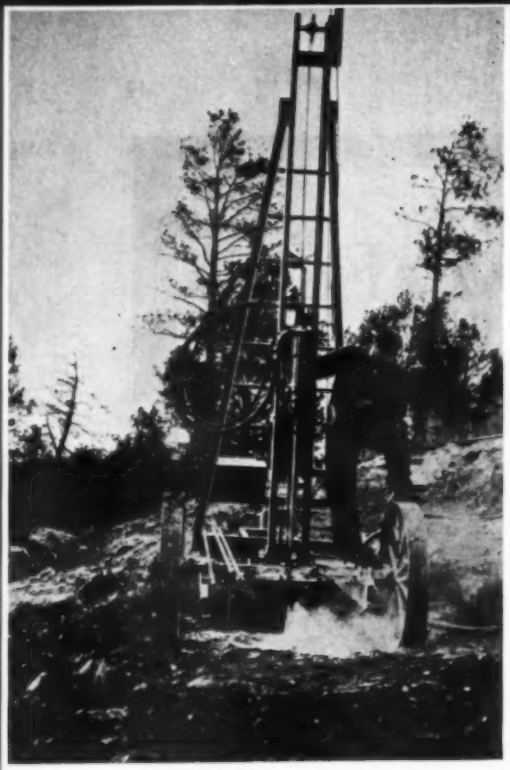

● *On a heavy rock cut in New Mexico, this Sullivan wagon drill with tower mounting was used to good advantage.*

The Highway Department's income will be derived from the following sources: regular Federal Aid, $609,375; 1935 Emergency Relief and Appropriation Act, $945,225; state gas tax, vehicle license fees and others, $4,400,000; and state bond issue, $1,000,000.

The department will spend $3,538,000 for new construction, and $2,500,000 for maintenance. In addition, $822,000 have been programmed for grade crossing eliminations.

The 1936 construction program includes the following: 180 miles of grading for $2,500,000 involving approximately 3,500,000 yards of excavation; 445 miles of gravel surfacing for $750,000 requiring 1,500,000 yards of material; 172 miles of oil treated surfacing for $86,000 requiring 1,110,000 gallons of oil; 6 miles of high type paving for $132,000; 4 miles of low type paving for $30,000; and 30 bridges at an estimated cost of $250,000.

Approximately 100,000 yards of excavation involved in contracts awarded in 1935 or previously will be carried over into 1936 and in addition to the work mentioned above. The estimated cost of this work is approximately $70,000.

New Jersey

A program of highway work in New Jersey for 1936 cannot be established until the State Legislature has appropriated money for such work. No information was available at the time of writing as to what action the Legislature might pursue in connection with highway work.

Federal funds have been a great aid in carrying on the regular state program. Last year New Jersey was allotted $1,675,751 of regular Federal Aid, $3,129,805 for highway, road and street construction and $3,983,826 for grade crossing elimination under the 1935 Emergency Relief Act. No information was given as to how much of the above funds have been obligated up the first of the year and how much remains to be spent in 1936.

Proponents of a super-transcontinental highway, stretching from coast to coast, have received aid in the futherance of their plans in view of the fact that Secretary of Interior Ickes recently advocated a through transcontinental highway in an address on national planning.

Intensive engineering studies have been made of this project, since it was first broached by the Pittsburgh Chamber of Commerce, and it is now held that a super-highway between the Atlantic and the Pacific would meet a national need, result in large direct and indirect employment over a considerable period, and prove self liquidating in a relatively short period.

The road as planned would stretch from ocean to ocean without a single intersection at grade. It would have two 45-foot strips, one for each direction, divided by a central curbing. Each strip would again be divided into fast and slow lanes. The total cost is estimated at not more than $400,000,000, with $300,000,000 as actual cost of construction at the rate of $100,000 a mile.

Revenue based on a toll charge of 1 cent per mile per pleasure vehicle is very conservatively estimated to average $150,000 for the entire highway per day or a total income of $54,750,000 a year.

New Mexico

Based on a preliminary estimate of next year's activities, New Mexico's expenditures for highway construction will be approximately 10 per cent larger than during the past year.

The highway department's tentative program, according to Office Engineer R. W. Bennett, calls for an expenditure of $7,500,000 for new construction, $1,250,000 for maintenance, and $750,000 for other expenses.

The above funds will be derived from the following sources: regular Federal Aid, $3,000,000; Federal Relief (NIRA), $350,000; 1935 Works Relief Bill, $3,000,000; state gas tax, $1,000,000; vehicle license fees and others, $400,000; and debentures $1,750,000.

The construction funds will be apportioned: 435 miles of grading and drainage structures for $600,000; 257 miles of gravel or crushed stone surfacing for $3,000,000; 272 miles of oil treated surfacing including rock asphalt surfacing for $3,000,000; and six bridges at an estimated cost of $900,000.

New York

The amount of money to be expended by the Highway Department is still unknown at this time as the matter of funds depends entirely upon the annual action of the State Legislature which convened after January 1. It is usually late in the spring before the Highway Division knows how much money it will receive from the Legislature.

Allotments received from Federal funds during the current fiscal year have included approximately $6,000,000 of regular Federal Aid; $11,000,000 for highway construction and $13,500,000 for grade separation projects appropriated under the Emergency Relief Appropriation Act of 1935.

North Carolina

Expenditures by the Highway Department for 1936 will be approximately 25 per cent greater than last year according to State Highway Engineer W. Vance Baise. Based on preliminary figures the department will have $22,325,000 available of which $12,825,000

● *E. W. Everly, Albuquerque, New Mexico, recently completed a highway project near Gallup, which involved approximately 120,000 yards of excavation. The illustration here shows his ¾-yard Diesel-powered shovel loading to a General Motors truck.*

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American Road Builders' Association
Cleveland, Ohio, January 20-24, 1936

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FEATURES OF CONVENTION

- Continuation of an adequate highway program.
- Federal Aid for the construction of roads and streets.
- Use of highway revenues for highway purposes (no diversion of gasoline tax and motor vehicle license funds).
- Use of established governmental administrative agencies (Bureau of Public Roads; States; Counties; Cities).
- Highway legislation, Federal and State.
- Highway Safety.
- Construction to be carried on under economically sound principles of the contract system.

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- Educational Division
- Engineers and Officials Division
- Highway Contractors Division
- Manufacturers Division
- Pan-American Division

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This year's big Road Show will point the way for 1936. It will have exhibits of all modern equipment, all new methods and all new types of materials. It will be the "World's Fair" of the Road Business. The demand for exhibit space is absolutely unprecedented, and the exhibits promise to be better than in any previous year.

No one can afford to miss this year's big show. It will give you new facts, new ideas, and new enthusiasm. It is the time to get new information and to meet old friends.

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Bring the ladies. An interesting program of entertainment has been prepared for them.

All Road Builders' Roads Lead to Cleveland
January 20, 21, 22, 23, and 24

●

American Road Builders' Association — National Press Bldg., Washington, D. C.

will be devoted to new construction, and $9,500,000 will be used for maintenance work.

The department's anticipated income will be derived from the following sources: regular Federal Aid, 10.8 per cent, $2,400,000; Emergency Federal Relief (NIRA), 1.3 per cent, $290,000; 1935 Works Relief Bill, 34.5 per cent, $7,710,000; state gas tax, 35.6 per cent, $7,960,000; vehicle license fees and others, 17.8 per cent, $3,965,000.

The tentative construction program includes: 350 miles of grading for $2,100,000; 350 miles of gravel or crushed stone surfacing for $1,400,000; 500 miles of oil treatment for $1,900,000; 110 miles of high type paving for $2,750,000; 80 miles of low type paving for $840,000; and a number of new bridges to be built at an estimated cost of $3,835,000.

In 1935 the cost of state taxes on gasoline rose above $600,000,000 for the first time since the levy was imposed in 1919. Federal taxes added about $170,000,000 to consumer's gasoline tax bill. Without including the unreported additional taxes upon gasoline imposed by some counties and municipalities, the consumer in 1935 paid a total gasoline tax bill approximately of $770,000,000. This sum exceeds one-third of the estimated $2,459,000,000 total retail value of the more than 18,000,000,000 gallons of gasoline consumed in 1935.

Giving consideration to the fact that the average price of gasoline in 1935 was only 13.55 cents per gallon, while the average state and Federal tax was 5.29 cents, it may be seen that these levies were, in effect, a retail sales tax of nearly 40 per cent. In some states taxes on gasoline were equivalent to 100 per cent of the retail price. In virtually every state they were 100 per cent, or more, of the wholesale price. Their collection cost the industry an estimated $22,500,000.

The average motorist contributed $31.74 in 1935 through Federal and state taxes on gasoline. Although the gasoline tax was levied with the expressed understanding that the revenue therefrom would be spent solely on highways, it is alarming to note that well over $100,000,000 of state gasoline taxes were diverted to non-highway uses.

North Dakota

An enlarged highway construction program has been established for North Dakota during 1936. With Federal funds forming the larger portion of the income the Highway Department expects to have $9,170,000 available according to Research Engineer J. N. Roherty. In addition to receiving $6,000,000 of the 1935 Works Relief Bill and $1,000,000 from the Emergency Federal Relief (NIRA), $1,420,000 will be received from the state gas tax, and $750,000 from vehicle license fees and other sources.

An allotment of the above funds shows $7,000,000 for construction, $1,920,000 for maintenance, and $250,000 for other purposes.

The tentative construction program calls for: 390 miles of grading for $2,150,000 involving 5,000,000 yards of excavation; 450 miles of gravel surfacing for $1,040,000 requiring 630,000 yards of material; 70 miles of oil treated surfacing for $460,000; 5 miles of low type paving for $150,000; and 50 bridge structures at an estimated cost of $3,200,000.

Work contracted for in 1935, or previously, and carried over into 1936 involves approximately 1,700,000 yards of excavation at a cost of $375,000. This work is included in the construction program stated above.

● *Here is a Diesel-powered Linn owned, by Dump Truck Service Inc., Buffalo, New York, building a fill for the approach to the South Grand Island bridge.*

National Park Road Funds

From Statement by Bureau of Public Roads, as of October 31, 1935

States	Under Construction	Not under Construction: Under Contract	Not under Construction: Not under Contract	Total
Arizona	$ 276,293		$ 157,200	$ 433,493
Arkansas	220,000			220,000
California	715,627		654,500	1,370,127
Colorado	271,560	$ 35,640	216,514	523,714
District of Columbia			120,000	120,000
Georgia	574,553		50,147	624,700
Hawaii		38,500		38,500
Idaho	4,500			4,500
Louisiana		66,060		66,060
Maine	186,923		346,500	533,423
Mississippi	238,000		15,500	253,500
Montana	564,110		458,382	1,022,492
Nebraska	23,695		148,500	172,195
New Jersey	17,800	176,600		194,400
New Mexico	30,840		89,100	119,940
North Carolina	835,111		44,504	879,615
Oregon	539,746		246,900	786,646
Pennsylvania	44,800		49,500	94,300
South Dakota	27,892	61,000		88,892
Tennessee	2,344,346		176,500	2,520,846
Utah	62,253			62,253
Virginia	3,092,615	206,700	882,352	4,181,667
Washington	869,475		121,430	990,905
Wyoming	1,300,790	147,455	664,750	2,112,995
Total	$ 12,240,929	$ 731,955	$ 4,442,279	$ 17,415,163

Total Unauthorized $6,222,323.

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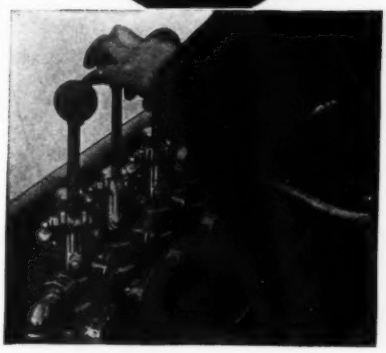

Actual photograph of a control bank showing the simplicity of design and the easy action of the control lever on a hydraulic system.

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● *A great deal of city street building will be carried on this year, the volume of which was not included in this forecast. Shown here, Dick-Smith Engineering Corporation's 10-B is widening a city street in Shamokin, Pennsylvania.*

Ohio

Ohio's 1936 road program has not yet been prepared at this time. According to the Department of Highways a rough estimate of the department's 1936 activities is based on an anticipated income of $26,000,000. The proposed construction program embraces 300 projects which will range in cost from $2,500 to $800,000. In all, approximately 550 miles will be constructed, including grading, drainage, and surfacing with rigid type pavement. Also included in the program will be a number of bridges, viaducts, and subways.

Oklahoma

An increase of 30% in the amount to be spent in 1936 for highways over the 1935 expenditures is the good news from Oklahoma. Altogether, it is estimated that almost $19,900,000 will be expended in 1936. Of this sum, about $15,200,000 will be used for highway construction, $4,000,000 for maintenance, and $700,000 for other purposes. The money to be spent will be made available from three main sources—$3,000,000 from regular Federal Aid as appropriated under the Hayden-Cartwright Bill; $9,600,000 from the Public Works Program; and $7,300,000 from state gas tax funds, vehicle license fees and other sources. Inasmuch as the program has not been completed, no estimate can be given at this time concerning just how the funds will be used.

Oregon

Construction expenditures in Oregon during 1936 will be, it is estimated, 19 per cent greater than during the past year.

The proposed construction program is based on having approximately $16,000,000 available which will be used as follows: $9,500,000 for construction work; $2,800,000 for maintenance work; $3,700,000 for bond retirements and other expenses.

Oregon's highway money will be received from the following sources: regular Federal Aid, $2,000,000; Federal Relief (NIRA), $1,000,000; 1935 Works Relief Bill, $4,000,000; state gas tax, $8,000,000; and vehicle license fees and others, $1,000,000.

The proposed construction program, according to Office Engineer S. H. Próbert includes the following: 253 miles of grading for $4,000,000 involving 5,000,000 yards of excavation; 159 miles of gravel or crushed stone surfacing for $750,000 requiring 580,000 tons of material; 145 miles of oil treated surfacing for $350,000; 29 miles of high type paving for $900,000; 31 miles of low type paving for $300,000; and 56 bridges at an estimated cost of $3,200,000.

Contracts for projects included in the 1936 program to the total value of $3,950,000 were awarded during the fall of 1935. These contracts had earned $400,000 by the end of the year.

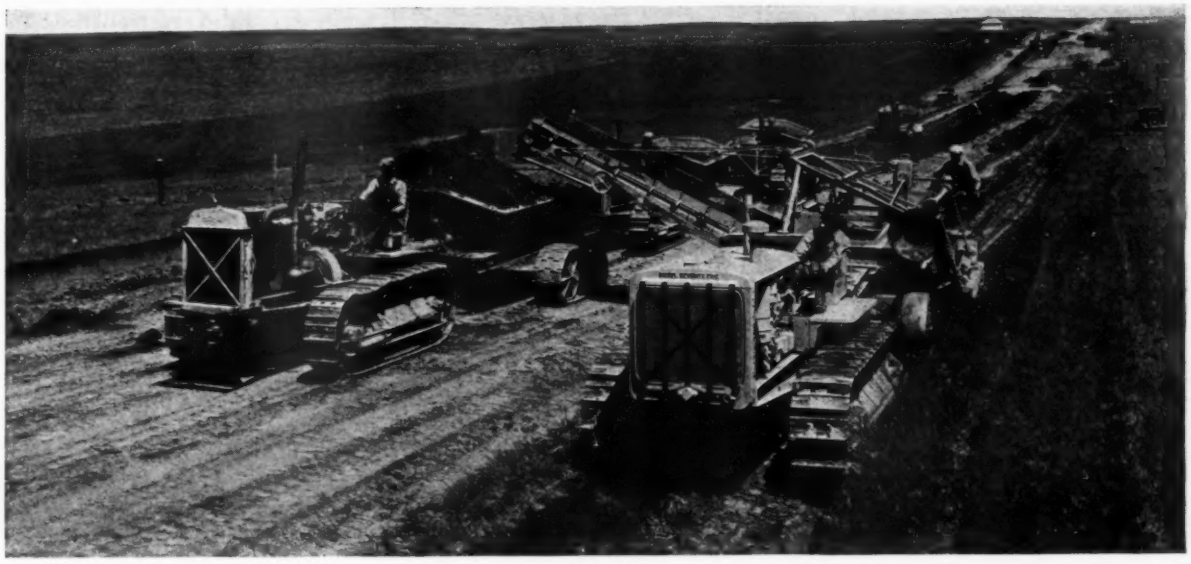
In addition to the highway construction program outlined in the foregoing paragraphs, Oregon anticipates the completion in 1936 of the five Oregon Coast bridges being built under PWA agreement. The completed cost of the structures will be approximately $5,600,000, of which the State of Oregon will contribute $4,200,000 and the balance, $1,400,000, will be received as a grant from the Federal Government. A total of $3,750,000 has been expended for the construction of the bridges up to the end of 1935, leaving $1,850,000 for the year 1936.

State Gasoline Tax Collections

for 32 States

State	Rate (cents)	First 9 Months 1935	First 9 Months 1934	Percentage Increase
Alabama	6	$ 7,583,468	$ 6,808,220	11.4
Arizona	5	2,419,847	2,353,441	2.8
Connecticut	2	3,954,253	3,733,612	5.9
Delaware	4(a)	1,139,198	935,014	20.8
Dist. of Columbia	2	1,660,652	1,526,299	8.8
Florida	7	13,265,479	12,105,945	9.5
Georgia	6	11,702,483	10,497,080	11.5
Idaho	5	2,238,423	2,403,611	-6.9
Illinois	3	23,838,618	22,874,533	4.2
Indiana	4	14,783,434	13,751,988	7.5
Iowa	3	9,431,106	8,985,574	4.9
Kansas	3	5,914,140	5,665,348	4.4
Kentucky	5	7,470,695	6,831,976	9.4
Louisiana	5	6,728,726	6,485,790	3.7
Maine	4	3,608,285	3,515,213	2.6
Maryland	4	6,450,625	6,095,075	5.8
Massachusetts	3	13,558,753	13,074,869	3.7
Montana	5	3,680,481	3,274,406	12.4
Nevada	4	795,402	695,081	14.4
New Hampshire	4	2,248,286	2,169,990	3.6
New Jersey	3	13,627,238	12,386,540	10.0
North Carolina	6	13,453,086	11,965,212	12.4
Ohio	4	28,839,018	27,253,524	5.8
Oregon	4	6,856,631	6,395,199	7.2
Pennsylvania	4(b)	28,724,007	24,824,612	15.7
Rhode Island	2	1,706,913	1,639,148	4.1
South Carolina	6	6,433,362	5,804,523	10.9
Tennessee	7	11,237,812	10,356,858	8.5
Vermont	4	1,526,338	1,461,690	4.5
Virginia	5	10,450,292	9,562,895	9.3
West Virginia	4	4,735,494	4,311,558	9.8
Wisconsin	4	13,246,237	12,730,385	4.1
Total		$283,308,782	$262,475,209	7.9

(a) Delaware tax increased to 4c on July 1, 1935.
(b) Pennsylvania tax increased to 4c on July 1, 1935.



● *On Highway 16, near Rapid City, South Dakota, these Caterpillar tractors, No. 48 elevating grader, and Euclid crawler wagons teamed up to produce good yardages for G. W. England & Sons Company.*

Pennsylvania

H. H. Temple, Chief Engineer, reports that approximately $34,000,000 will be available in 1936 for state highway construction. $9,000,000 of this money will come from Works Program highway funds; $11,000,000 from Works Program grade crossing funds; $11,000,000 made up of Federal Aid matched by state funds; and about $3,000,000 of state one hundred per cent construction. No information is available at this time how this money will be apportioned.

Rhode Island

Highway construction work in Rhode Island in 1936 is expected to represent an increase of 17% over 1935 figures. This estimate is based on a program in 1936 that calls for a total expenditure of over $4,000,000. Construction is expected to take $2,900,000 of this sum, with maintenance and other uses taking $800,000 and $300,000 respectively. Twenty miles of grading work, with 160,000 yards of material to be moved, will take $90,000. $100,000 will be used to build twenty miles of gravel or crushed stone surfacing. Another $100,000 will be used for ten miles of high type paving. $3,000 is to be used to give oil treatment to ten miles of road. The money to be spent in 1936 will come from both Federal and State sources—$600,000 from regular Federal Aid (Hayden-Cartwright Bill); $1,700,000 from Public Works Relief Program; $1,100,000 from state gas tax; and $600,000 from vehicle license fees and other sources.

South Carolina

The activities of the Highway Department during the fiscal year ending June 30, 1935, have resulted in the addition of approximately 282 miles of improved roads, either high type or low type surfacing, to the state highway system. The highway system as of that date consisted of 2400 miles of standard type pavement; 1545 miles of bituminous surfacing; and 1243 miles of improved earth type surfacing.

Information regarding South Carolina's 1936 highway program is not available at this time. However, for the fiscal year beginning July 1, 1935, Federal allotments made to the state include the following: regular Federal Aid, $1,690,000; 1935 Emergency Relief Act, $2,700,000 for highway work, and $3,060,000 for grade crossing eliminations.

South Dakota

With $10,400,000 as the amount to be spent in South Dakota in 1936, H. E. Abell, Office Engineer, estimates that this represents a gain of 10% over 1935 highway work. Federal Aid (Hayden-Cartwright Bill) accounts for $1,200,000 of this money; Public Works Program funds provide $6,000,000; and a carry over of $500,000 is made from

Forest Highway Funds

From Statement by Bureau of Public Roads as of October 31, 1935

States	Programmed Work				Balances Available for Programming	Grand Total
	Under Construction	Not under Construction		Total		
		Under Contract	Not under Contract			
Alabama					$ 2.37	$ 2.37
Alaska	$ 244,000.00	$ 82,000.00	$ 185,500.00	$ 511,500.00	645,205.33	1,156,705.33
Arizona	194,100.00	224,294.00	82,000.00	500,394.00	11,355.48	511,749.48
Arkansas	31,955.00		69,564.00	101,519.00	7,534.09	109,053.09
California	1,131,850.00	65,000.00	113,500.00	1,310,350.00	59,120.04	1,369,470.04
Colorado	236,506.00		30,000.00	266,506.00	87,385.14	353,891.14
Florida	124,820.00			124,820.00	2,883.84	127,703.84
Georgia	59,764.00		15,099.00	74,863.00	1,400.61	76,263.61
Idaho	1,040,662.00		60,000.00	1,100,662.00	104,442.98	1,205,104.98
Illinois					7,251.17	7,251.17
Kentucky	27,674.00			27,674.00	5,703.00	33,377.00
Louisiana					10,952.56	10,952.56
Michigan	15,000.00		41,872.71	56,872.71	5,605.59	62,478.30
Minnesota	127,834.00			127,834.00	2,780.50	130,614.50
Mississippi					2,115.00	2,115.00
Missouri			17,964.78	17,964.78	1,588.00	19,552.78
Montana	475,500.00		154,700.00	630,200.00	56,003.03	686,203.03
Nebraska			21,306.40	21,306.40	1,207.80	22,514.20
Nevada		60,000.00		60,000.00	24,860.29	84,860.29
New Hampshire	115,974.00			115,974.00	2,808.35	118,782.35
New Mexico	162,914.00		53,083.00	215,997.00	72,066.53	288,063.53
North Carolina			81,037.64	81,037.64	1,289.79	82,327.43
Oklahoma	100,000.00			100,000.00	3,585.34	103,585.34
Oregon	1,388,500.00		150,000.00	1,538,500.00	172,689.54	1,711,189.54
Pennsylvania	13,504.00		19,180.72	32,684.72	915.27	33,599.99
South Carolina	5,550.00			5,550.00	16,768.65	22,318.65
South Dakota	43,120.00			43,120.00	8,436.30	51,556.30
Tennessee	59,005.00		20,796.79	79,801.79	1,910.00	81,711.79
Texas					1,375.00	1,375.00
Utah	210,048.00			210,048.00	16,010.02	226,058.02
Virginia	37,619.00		20,443.99	58,062.99	11,211.72	69,274.71
Washington	653,000.00	16,000.00	70,000.00	739,000.00	150,275.29	889,275.29
West Virginia			43,871.60	43,871.60	829.20	44,700.80
Wisconsin	124,911.00			124,911.00	2,813.94	127,724.94
Wyoming	221,562.00			221,562.00	39,588.07	261,150.07
Total	6,845,372.00	447,294.00	1,249,920.63	8,542,586.63	1,539,969.83	10,082,556.46

● *No "wash board" gravel road here. Maintenance departments in South Dakota keep their roads in tip-top condition. The Caterpillar Diesel-powered Auto-Patrol is shown working near Deadwood.*

Emergency Relief appropriation. The state gas tax furnishes $2,100,000 for highway work, and vehicle license fees, etc. provide another $600,000. Of the total sum to be expended in 1936, $8,400,000 will be used on highway construction, $1,500,000 on maintenance, and $500,000 for other purposes. 400 miles of grading are scheduled, requiring the moving of 4,000,000 yards of material, and costing $2,200,000. In addition, $1,600,000 will be spent on 300 miles of gravel or crushed stone roads. $800,000 will be spent for oil treatment of 125 miles, and $500,000 for 20 miles of high type paving. Bridge structures, 160, are planned at a cost of $3,300,000. Contract work carried over into 1936 is valued at $150,000.

Tennessee

Based on a preliminary estimate, the 1936 expenditures by Tennessee for highway construction will show an increase of approximately 60 per cent over last year according to Office Engineer, Wm. S. Whitman. The proposed construction program calls for an expenditure of $9,756,000 which will be derived entirely from Federal funds as follows: regular Federal Aid, $1,575,000; Federal Relief (NIRA), $85,000; and 1935 Works Relief Bill, $8,096,000.

Maintenance work will require $3,000,000 and other departmental expenses $500,000, all of which will be

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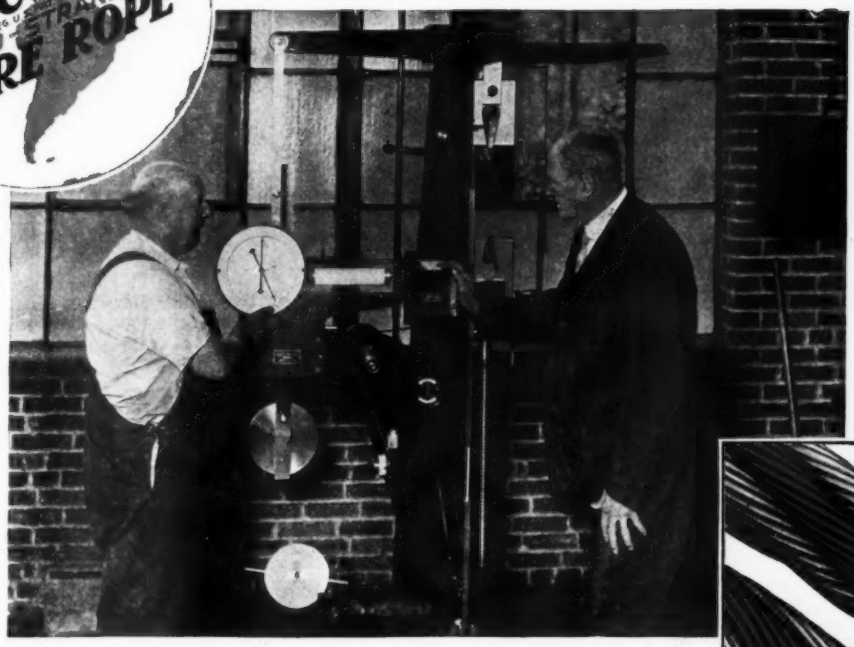
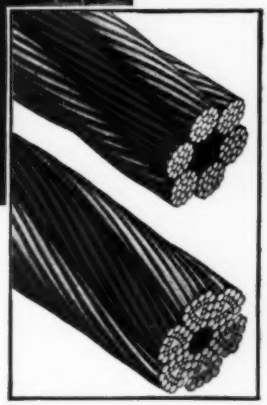


The man at the left has been with our company for 60 years, and he is still active. On the right is a man who was in our active service for 49 years, and on our retired list for over 17 years. The long and practical experience of these and similar craftsmen in our organization has been a big factor in developing and maintaining Leschen Quality.



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● *Special platforms were built by the Arundel Corporation, Baltimore, Maryland, on which were operated several Ingersoll-Rand wagon drills when they encountered this stretch of steep, sloping ground on their section of the Great Smoky Mountain National Parkway project in Tennessee.*

● *Plenty of rock was encountered by Sammons & Robertson Company of Huntington, West Virginia, on their section of the new Skyline Parkway near Luray, Virginia. Ingersoll - Rand compressors and drills helped solve the rock problem successfully.*

derived from state gas tax revenue and vehicle license fees.

The proposed construction program includes: 160 miles of grading for $4,481,000 requiring 5,000,000 yards of excavation; 90 miles of high type paving for $2,250,000 requiring 1,056,000 square yards of concrete; 35 miles of low type paving for $525,000; and 50 bridges . at an estimated cost of $2,500,000.

Texas

During the fiscal year ending August 31, 1935, Texas spent $24,663,584 for highway construction. This was a slight decrease compared with the $25,524,000 spent the year before. Maintenance work during the same period required an expenditure of $9,592,864. Equipment purchases during the year amounted to $338,921 and with certain other expenditures brought the total disbursements for the year to $38,646,425, or approximately two and one-half million dollars more than was spent in 1934. The cash balance on hand at the beginning of the year amounted to $9,235,791.

As of September 1, 1935, the following sums are available to the Highway Department under the various programs as shown:

Works Program—Highways	$11,989,350
Works Program—Grade Crossings	10,855,982
Regular Federal Aid—Federal Funds	7,777,504
Regular Federal Aid—State	7,777,504
National Recovery Work Relief Program	6,086,810
Emergency Relief—Federal Funds	378,500
Emergency Relief—State Funds	378,500
Galveston Causeway—PWA Project	1,500,000
Neches River Bridge—PWA Project	2,500,000
	$49,244,150

Several of these programs, of course, are wholly dependent on labor furnished from re-employment rolls, and the expenditure of the entire sums for the carrying to the completion of the projects included in these programs cannot be guaranteed or accurately forecast.

During the fiscal year ending August 31, 1935, the amount of contracts let and the cost were as follows: 528 miles of grading and small drainage structures for $6,063,476; 27 miles of gravel and caliche surfacing for $509,098; 946 miles of asphalt surfacing for $6,403,189; 173 miles of concrete and brick

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● *M. S. Ross, well known western contractor, used a chute 1500 feet long, in which to drop his material for a fill from the top of a 169-foot cliff on his contract to build a 1.7-mile shortcut on the new Pacific Highway near Nisqually, Washington. The job included a channel change 4700 feet long in which were 60,000 yards of excavation. In addition, one heavy cut ran 640,000 yards, involving a cut 100 feet deep and the building of a fill 96 feet high. A three-yard dragline loaded to a 20-yard Isaacson buggy hauled by a Cletrac 80 Diesel from the cliff to the top of the chute. At the bottom, on the fill level, another 20-yard Isaacson buggy and a 12-yard carry-all scraper pulled by Cletrac Diesels, assisted by a trail-builder, built up the fill in ½-foot layers.*

surfacing for $5,662,999; bridges totaling $1,074,265; and roadside improvements for $105,444. These contracts total 1676.95 miles of improvement at a total cost of $19,818,473.

During the same period, contracts brought to completion follow: 701 miles of grading and small drainage structures for $8,083,486; 74 miles of gravel and caliche surface for $596,719; 864 miles of asphalt surfacing for $7,310,240; 210 miles of concrete and brick surfacing for $5,402,190; bridges for $3,303,000; and roadside improvements for $93,931. These contracts completed total 1849.84 miles at a cost of $24,789,578.

In addition to the projects completed, there were the following miles under active construction on September 1, 1935: 392 miles of grading and small drainage structures at an estimated cost of $4,969,375; 18 miles of gravel and caliche surfacing for $461,256; 567 miles of asphalt surfacing for $4,434,371; 101 miles of concrete and brick surfacing for $3,839,977; and bridges for $1,113,402. These total 1,080 miles at an estimated cost of $14,818,383.

The Highway Department has been concentrating its efforts on closing gaps in the main highways to facilitate travel to the Texas Centennial exposition which will be held in Dallas this year. The exposition is to celebrate the 100th anniversary of Texas' freedom to which celebration the entire nation is cordially invited.

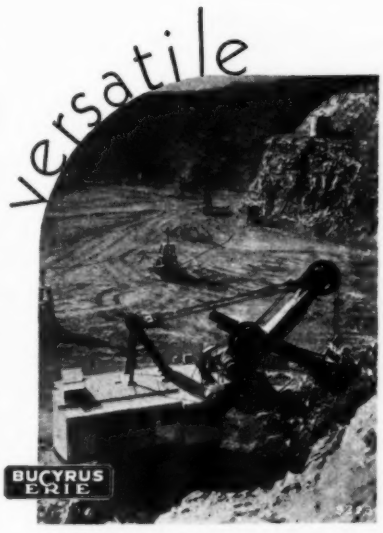
"The total motor vehicle tax collections during the calendar year of 1934 from Federal, State, Municipal and County sources exceeded $1,264,000,000 of which about 22% was paid to the Federal government, 69% to the States, 1% to the Municipalities and 8% to the Counties," stated Charles M. Upham, Engineer-Director of the American Road Builders' Association in a recent address at the New Jersey State Safety Conference. ". . . The estimated diversion in 1934 was $175,000,000 which meant the loss of the equivalent of 400,000 highway jobs or the support of 1,200,000 people . . . "

Utah

A 25% increase in expenditures for highway work in 1936 over 1935 is estimated by K. C. Wright, Chief Engineer. The total amount that is expected to be available for highways is $7,675,000. Of this sum, $6,000,000 will be used for construction work, $1,200,000 for maintenance, and $475,000 for miscellaneous expenses. Federal Aid (from the Hayden-Cartwright Bill) provides $1,675,000; Public Works Relief Program furnishes $3,300,000; the state gas tax gives $2,600,000; with the vehicle license fees providing $100,000. 180 miles of grading to the extent of 2,500,000 yards is planned at a cost of $1,240,000. Surfacing work includes 100 miles of gravel or crushed stone highway at a cost of $700,000; 100 miles of oil treated roads at a cost of $400,000; 30 miles of high type paving at $1,800,000; and 30 miles of low type paving at $360,000. In addition, 35 new bridges will be built at a cost of $1,500,000. Of work awarded in 1935 or previously, about 1,000,000 yards of material will be moved in 1936, at an expenditure of $450,000.

Vermont

Highway expenditures for construction work carried on in Vermont during 1936 will show only a slight increase over the preceding year. While the 1936 program is not completely worked out it is estimated that the departmental revenue will total $4,500,000, of which $600,000 will be received from regular Federal Aid, $1,600,000



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● *Air for the Ingersoll-Rand wagon drill is supplied by a two-stage portable compressor of the same make. This equipment saw plenty of service on that portion of the Skyline Parkway built by Waugh Brothers Construction Company of Fayetteville, West Virginia.*

from the 1935 Works Relief Bill, and $2,300,000 from state gas tax.

The proposed construction plan calls for an expenditure of $3,000,000 leaving $1,500,000 for maintenance work and other expenses.

The program includes: 4 miles of grading, for $140,000; 7 miles of gravel surfacing for $120,000; 7 miles of concrete or macadam surfacing for $260,000; 41 miles of mixed-in-place surfacing for $1,280,000, all of which will require approximately 350,000 yards of excavation. In addition about 75,000 yards of excavation on projects for which contracts were awarded in 1935 or previously will be carried over in 1936. The amount to be earned on these contracts is estimated at $40,000.

Virginia

While final figures are not yet available, the Department of Highways expects to have approximately $13,926,954 for construction work during 1936. In addition, maintenance requirements will need $5,525,000, secondary road work, $6,240,000, and other expenses will amount to $349,000, making a total expenditure for the year of $26,040,954 according to Auditor C. J. Allard. This amount of money is an increase of 14.5 per cent over last year.

The department's income will be received from the following sources: regular Federal Aid, $2,350,000; 1935 Works Relief Bill, $7,426,954; state gas tax, $7,667,000; and vehicle license fees and other sources, $8,597,000.

A detailed forecast of the distribution of the $13,926,954 used for construction is not available at the time of writing.

Washington

Funds expected to be available for construction in 1936 are about 15 per cent greater than in 1935, according to L. V. Murrow, Director of Highways. The proposed budget sets up $9,200,000 for new construction, $2,500,000 for maintenance, and $900,000 for other necessary expenditures.

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● *Beautiful mountain scenery is encountered by Myers and Goulter of Seattle, Washington, on their contract on the Stevens Pass Road between Central Washington and the coast. The illustration here shows their Bucyrus-Erie 37-B shovel, powered with a Caterpillar Diesel engine, widening a portion of the road.*

This total of $12,600,000 will be received as follows: regular Federal Aid, $1,900,000; 1935 Works Relief Bill, $5,000,000; state gas tax, vehicle license fees and others, $5,700,000.

Detailed figures showing distribution of the construction money are not available, but in general funds will be apportioned as follows: 32 per cent to grading and surfacing with crushed stone; 20 per cent to oil treatment; 15 per cent for high type pavement; and 33 per cent for bridge structures.

West Virginia

Based on preliminary figures from the Road Commission of West Virginia, the volume of highway construction carried on in 1936 will be approximately the same as in 1935.

It is expected that the Highway Commission will have available approximately $13,190,000 received from the following sources: regular Federal Aid, $2,356,793; 1935 Works Relief Bill, $4,333,937; state bonds, $3,000,000; state gas tax, $2,000,000; vehicle license fees and others, $1,499,270.

Figures showing the 1936 highway program are not available but it is expected that $9,690,000 will be used for new construction, while maintenance work will require $3,500,000.

Wisconsin

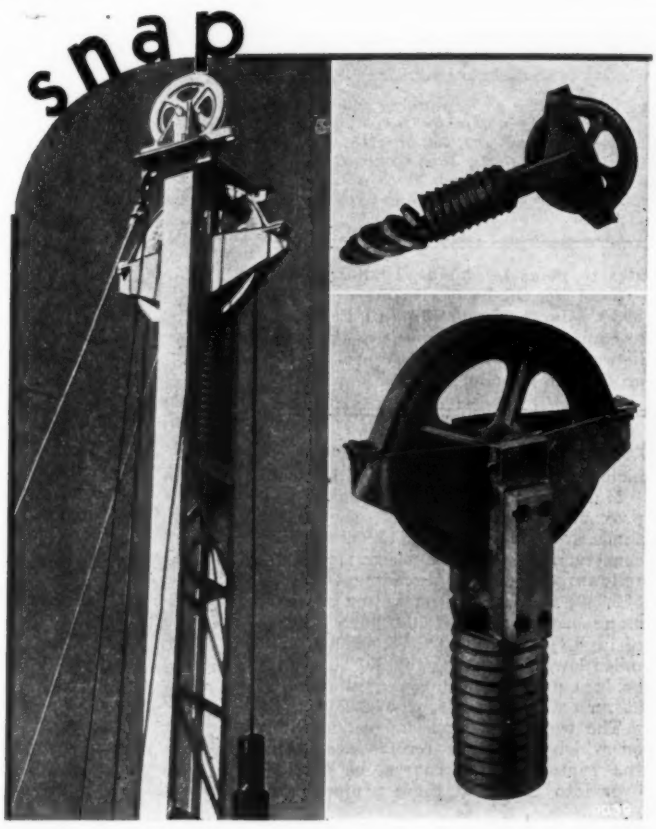
Wisconsin's 1936 highway construction program calls for an expenditure of $19,937,000 which is roughly $4,400,000 larger than last year's.

This program is based on receiving income as follows: regular Federal Aid, $3,045,000; 1935 Works Relief Bill, $9,-

Funds for Roads in Public Lands

From statement by Bureau of Public Roads as of October 31, 1935

States	Unobligated balance and obligated but not under construction	Under construction	Total
Arizona	$ 547,134.60		$ 547,134.60
California	431,769.70	$ 162,282.07	594,051.77
Colorado	113,682.60		113,682.60
Idaho	111,833.57	46,800.05	158,633.62
Montana	138,448.00	137,901.00	276,349.00
Nevada	591,228.52	265,745.11	856,973.63
New Mexico	416,380.14		416,380.14
North Dakota	65,819.76		65,819.76
Oklahoma	23,162.00	22,580.00	45,742.00
Oregon	131,817.10	42,513.90	174,331.00
South Dakota	96,481.00	133,010.00	229,491.00
Utah	269,607.45	62,298.55	331,906.00
Washington	775.50	75,863.50	76,639.00
Wyoming	45,610.47	280,834.00	326,444.47
Total	$2,983,750.41	$1,229,828.18	$4,213,578.59



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SOUTH MILWAUKEE, WISCONSIN

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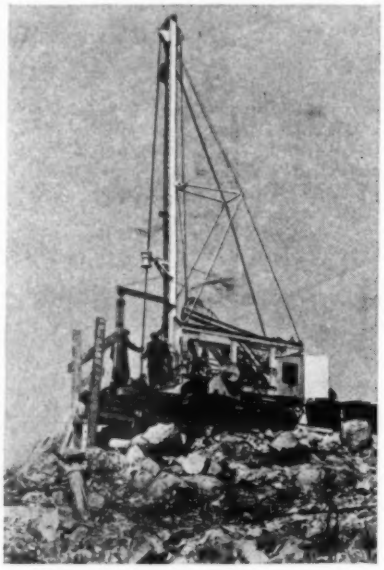
● *Kochring Dumptors solved the hauling problem on this West Virginia road project for Haley-Chisholm & Morris, Inc., Charlottesville, Virginia. A Bucyrus-Erie Type B steamer handles the loading.*

Mexico plans to spend $10,000,000 to expand its highway facilities during 1936. About $7,000,000 will be spent to complete the Pan American Highway between Mexico City and Nuevo Laredo on the Rio Grande.

847,000; state gas tax, $3,888,000; vehicle license fees and others, $3,157,000.

Maintenance work will require approximately $4,000,000 of the total funds available, leaving $15,937,000 for construction which is programmed as follows: 380 miles of grading for $3,300,000; 460 miles of gravel or crushed stone surfacing for $1,500,000; 95 miles of high type paving for $3,000,000; 150 miles low type paving for $910,000 and bridges and grade crossing structures at an estimated cost of $7,227,000.

The work which was advertised and on which bids were received early in the winter will, of course, be carried over into 1936, but these projects are part of the 1936 program. Very little 1935 work, approximately only 100,000 yards of excavation, will be carried over into 1936 at a cost of $60,000.



● *This gasoline-powered all-steel Bucyrus-Armstrong 29-T blast-hole drill produces good footages for Foley Brothers, St. Paul, Minnesota, in a northern Wisconsin quarry.*

Wyoming

The amount of money expected to be available for highway use, according to Office Engineer, C. C. Warrington, will be approximately $6,060,000, based on receiving: $1,560,000 from regular Federal Aid; $100,000 from Federal Relief (NIRA); $2,500,000 from the 1935 Works Relief Bill; $1,300,000 from state gas tax; $600,000 from vehicle license fees and other sources.

After allotting $700,000 for maintenance requirements and $300,000 for other departmental expenses, the department expects to have $5,060,000 available for new construction work.

"I advocate highway construction in normal times. In an economic crisis there is no more generally satisfactory public work than Federal road building. Substantially 85 per cent of the costs go to labor, directly or indirectly; all of the States are benefited; all of the counties in all of the States are aided; labor is provided for. Last, but not least, the taxpayers must pay for relief and for public works. In highways there is an adequate return for every dollar expended for relief and for recovery. Highways are the most satisfactory of all public works."—Honorable Will M. Whittington, Mississippi, Committee on Roads, U. S. House of Representatives.

The tentative program of construction calls for: 300 miles of grading, at an estimated cost of $2,400,000; 300 miles of gravel or crushed stone surfacing for $660,000; 250 miles of oil treated surfacing for $1,000,000, requiring approximately 5,000,000 gallons of oil; 1.5 miles of high type paving for $100,000; and 15 bridges at an estimated cost of $900,000.

Approximately $1,200,000 worth of work contracted for 1935 will be carried over into 1936.

On pages 32 and 33 of this issue, we are pleased to present an interesting article on Wyoming highways by State Highway Superintendent James B. True.

Before Buying Your Trailer—

Investigate the Money Saving Features of The La Crosse All Purpose Trailer

- *Low Operating Cost*
- *Low Initial Cost*
- *Low Loading Platform*
- *Pneumatic Tires*
- *Greater Payload Per Pound Trailer Weight*

Write for Details

Capacities: 5 to 50 Tons

C. R. JAHN CO., La Crosse, Wis.

For your convenience in writing to C. R. Jahn Co., you will find a card bound in this issue.

Reducing Costs at Cape Girardeau

(*Continued from Page 29*)

uous bucket elevator which also elevates the stone from the two hammer mills and the No. 8 gyratory crusher to a belt conveyor system connecting the main crusher building with the cement mill stone storage pile and the commercial stone screening plant. This elevator has a partition welded in the center of each bucket so that it can hoist two different sizes of stone simultaneously.

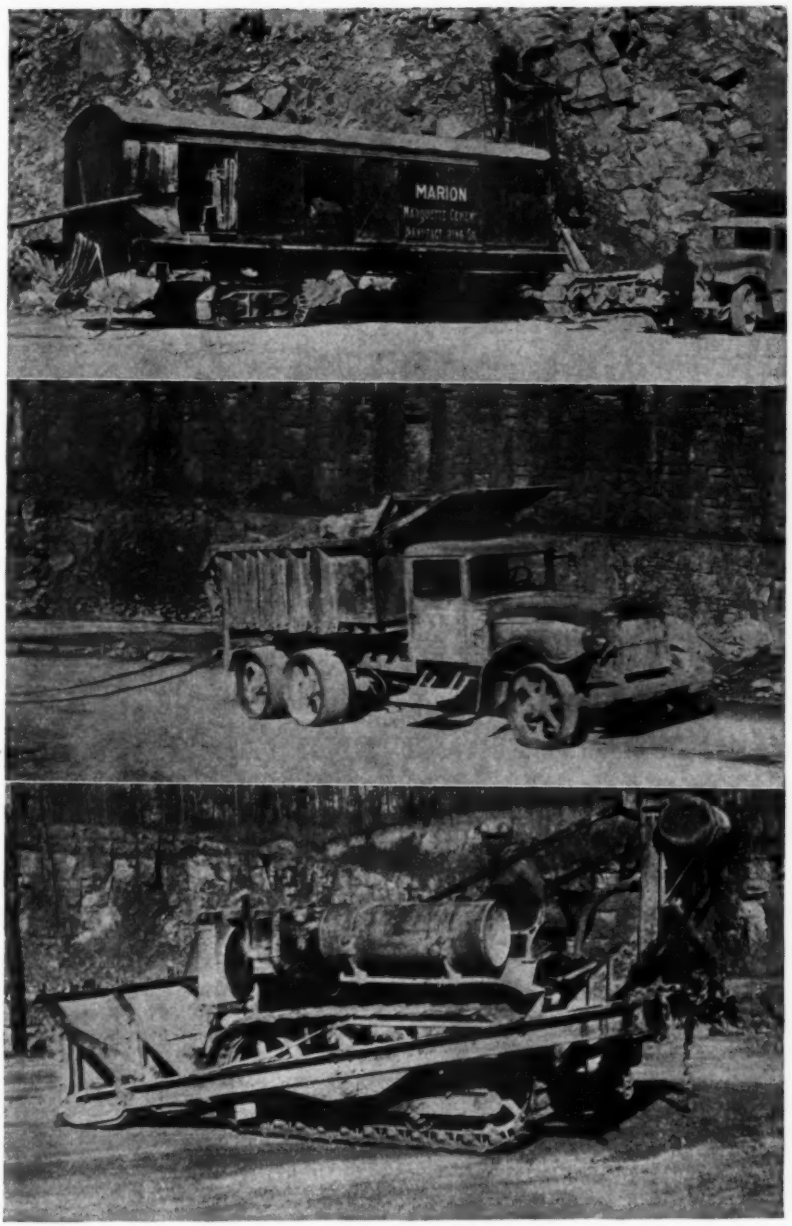
The elevator discharges its load onto 30-inch and 24-inch Link Belt conveyors running side by side through the first bridge, a distance of 350 feet, to No. 3 tower which is a junction. From this junction a 30-inch Link Belt conveyor 650 feet long carries the mill stone to a 30-inch distributing belt conveyor, 205 feet long, running at right angles and over a tunnel. This distributor belt feeds the mill storage pile which will hold 30,000 tons of stone. Stone is extracted from the pile through the tunnel underneath as needed by mill requirements.

From the junction at No. 3 tower, another inclined 30-inch Link Belt conveyor, 300 feet long and running at right angles, conveys the stone to two Allis-Chalmers 72-inch by 27-foot rotary screens at the commercial stone plant. The oversize stone or 2-inch plus from the rotary screens is spouted into a 4-foot Symons Cone Crusher. The stone from the cone crusher is elevated by a continuous chain bucket elevator to double deck 4x8-foot and triple deck 4x8-foot Niagara vibrating screens. The sized stone from these screens is spouted to the respective bins.

There are nine 12x20x16-foot stone bins, each having a belt conveyor underneath so that the stone can be conveyed from the bins to the cement mill stone storage pile if desired. Each bin also has loading spouts for truck or railroad car loading.

The two rotary screens will be taken out and replaced by two 4x 16-foot triple deck Allis-Chalmers vibrating screens this winter.

Stockpiling of commercial stone is handled by an Ohio steam locomotive crane and a standard-gauge home-made gas locomotive. This handy machine was made by mounting a 7-ton 36-inch gauge gasoline Whitcomb locomotive on the running gears of an old steam locomotive. Power reaches the driving wheels through a chain and sprocket drive. This locomotive is not much to look at but really does the work. The commercial stone plant is served by the Frisco and the Missouri Pacific Railroads.



● *Top: This Marion railroad-type shovel, crawler mounted and electrically operated, loads to one of the Sterling trucks. Center: Carrying a full load, the truck negotiates a 14 per cent grade coming up out of the second level to the dump on the first level. Bottom: The Caterpillar 30 and bulldozer keep the quarry floor clean and free from rocks that would cut the tires on the trucks.*

EXCAVATING ENGINEER Bargain Counter

★ ★ ★ THE ITEMS LISTED on these pages have been selected because they offer unusual values to the man who is looking for a bargain. Some of this equipment is surplus stock which has never been used, some is rebuilt and carries new equipment guarantee, some is just plain used. But every item is priced for quick sale. If any of this equipment fits your needs send a postcard or letter, mentioning the reference number, to *Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.* We'll pass your inquiry along to the owner and you will receive price and complete information promptly. Act now — with advancing prices on new stock this equipment will move fast.

COMPLETE FRONT END EQUIPMENT

Shovel Equipment

½ CU. YD. DIPPER, 16' boom, 13'8" dipper handle. Shovel equipment suitable for type "A" shovel. NEW. SE-30.

⅝ CU. YD. DIPPER, 12'6" dipper handle, 16' boom. Shovel equipment suitable for type "A" shovel. NEW. SE-31.

¾ CU. YD. DIPPER—23' BOOM—12'6" DIPPER HANDLE—Shovel Equipment suitable for 20-B Gas or Diesel. NEW. SE-15.

¾ CU. YD. DIPPER 25'9" BOOM—14' DIPPER HANDLE—Shovel Equipment suitable for 30-B Diesel. NEW. SE-17.

¾ CU. YD. DIPPER—20'6" BOOM, 17' DIPPER HANDLE, high lift shovel equipment suitable for 20-B steam. New SE-32.

⅞ CU. YD. DIPPER—21'9" BOOM and ENGINE — 15' DIPPER HANDLE — High Lift Shovel Equipment. Suitable for 31-B Steam. NEW. SE-18.

1 CU. YD. DIPPER—20' BOOM—15' DIPPER HANDLE — Rope Crowd Shovel Equipment, suitable for Osgood "Conqueror." Good mechanical condition. Low Price. SE-24.

1 1 CU. YD. DIPPER—26' boom, 17' handle Shovel equipment—Will fit 30-B. SE-35.

1¼ CU. YD. DIPPER — 25' BOOM — 17' DIPPER HANDLE — Slightly Used Rope Crowd High Lift Shovel Equipment suitable for Model 37-B. New Machine Guarantee. SE-5.

1½ CU. YD. DIPPER—27' BOOM——17' DIPPER HANDLE—High Lift Rope Crowd Shovel Equipment suitable only for Bucyrus-Erie 43-B machines. Rebuilt—New Machine Guarantee. SE-23.

1 1¾ CU. YD. DIPPER, 30' boom, 19' handle, high lift shovel equipment—Will fit 50-B. New. SE-33.

1 1¾ CU. YD. DIPPER, 22' boom, 16' handle, shovel equipment—Will fit 43-B. New. SE-34.

Skimmer Scoop

⅝ CU. YD. DIPPER—20' Boom together with all necessary ropes and material to completely convert Bucyrus-Erie 1020 Shovel, Clamshell or Dragline to Skimmer Scoop Machine. NEW. Shipment 2 to 3 weeks. SS-1.

Dragline Equipment

40' CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2—20-B—31-B. NEW. DL-3.

BRAND NEW Ropes included with each of above Dragline Equipments.

Trench Digging Equipment

1 CU. YD. 42½" WIDE—Solid type Dipper—24' Boom and all auxiliary equipment. Will dig maximum depth 22'. For application to GA-2 or GA-3 Shovel. Rebuilt—New Machine Guarantee. DS-5.

BRAND NEW PAGE, two dippers each ¾ cu. yd., one 38" wide over cutters, the other 49½" wide over cutters. 17'1½" Boom and all necessary auxiliary equipment. Will fit Bucyrus-Erie 1030 or 1035. DS-7.

1-CU. YD. 42½" WIDE SOLID TYPE DIPPER—24' Boom and all auxiliary equipment—will dig maximum depth of 22'—For application to GA-2 or GA-3 Clam Shell or Drag Line. Rebuilt—New Machine Guarantee. DS-8.

BRAND NEW Ropes included with each of above Trench Digging Equipments.

DIPPER HANDLES

1 7'6" 1030 TUNNEL—Complete. New. H-1.
1 7'10½" 20-B TUNNEL (two sticks). New. H-2.
1 9'0" 31-B TUNNEL (two sticks). New. H-3.
3 9'0" 30-B TUNNEL (two sticks each). New. H-4.
1 9'6" 20-B TUNNEL (two sticks). New. H-5.
1 9'6" 31-B TUNNEL (two sticks). New. H-6.
1 12 0" 18-B—Complete. New. H-7.
1 12'6" D-2, 31-B—Complete. New. H-8.
1 12'6" D-2, 31-B—Complete. New. H-9.
1 13'0" 1020—Complete. New. H-10.
3 13'0" 1030—Complete. New. H-11.
1 15'0" 20-B OIL (two sticks). New. H-12.
3 15'0" E-2, 41-B—Complete. New. H-13.
1 15'0" 43-B—Complete. New. H-15.
1 16'0" TYPE "A"—Complete. New. H-16.
2 16'0"—43-B—Complete. New. H-17.
1 17'0"—TYPE "A"—Complete. New. H-18.
1 17'0"—20-B HIGH LIFT—Complete. New. H-19.
1 17'0"—37-B—Complete. New. H-20.
1 17'0"—37-B—Complete. Used. H-21.
1 17'0"—43-B (two sticks). New. H-22.
1 17'0"—50-B OIL (two sticks). New. H-23.
1 19'0"—50-B (two sticks). New. H-24.
1 19'6"—37-B—Complete. New. H-25.

BOOMS

1—24' D-2 DRAG SHOVEL BOOM—New. JA-1.
4—18' 20-B STEAM SHOVEL BOOMS—New. JA-2.
1—18' 31-B STEAM SHOVEL BOOM—New. JA-3.
2—20'6" 20-B STEAM SHOVEL BOOM—New. JA-4.
1—21'9" 31-B STEAM SHOVEL BOOM—New. JA-5.
1—22'6" GA-2 or GA-3 SHOVEL BOOM—New. JA-6.
3—23' 20-B DIESEL, GAS OR ELECTRIC SHOVEL BOOM—New. JA-7.
1—24' GA-2 or GA-3 SHOVEL BOOM—New. JA-8.
2—24' 43-B ROPE CROWD SHOVEL BOOM—New. JA-9.
1—25'9" 30-B DIESEL SHOVEL BOOM—New. JA-10.
1—26' 20-B DIESEL SHOVEL BOOM—New. JA-11.
1—26' 30-B STEAM SHOVEL BOOM—New. JA-12.
2—26' D-2 SHOVEL BOOM—New. JA-13.
1—26' D-2 SHOVEL BOOM—Used. JA-14.
1—26' 50-B STEAM SHOVEL BOOM—New. JA-15
3—27' 43-B ROPE CROWD SHOVEL BOOM—New. JA-16.
1—30' 50-B ELECTRIC SHOVEL BOOM—New. JA-17.
3—30' 50-B STEAM SHOVEL BOOM—New. JA-18.
1—40' 20-B, 31-B and D-2 DRAGLINE BOOM—Used. JA-20.
1—45' 30-B, E-2, 41-B and 42-B DRAGLINE BOOM—New. JA-22.

Address all inquiries to Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.

DIPPERS

Small Machines

3 ½ CU. YD.—Plate Front—Will fit 1020 Drag Shovel. New. D-45.

2 ¾ CU. YD.—Plate Front—Will fit 20-B. New. D-12.

1 2/3 CU. YD.—Plate Front—Will fit 14-B. New. D-13.

2 ¾ CU. YD.—Rock Type—Will fit 20-B. New. D-15.

1 ⅜ CU. YD.—Plate Front—Will fit 1030 or 1035. New. D-18.

1 ⅜ CU. YD.—Ins. Tooth—Will fit 1030. New. D-47.

2 1 CU. YD.—Ins. Tooth—Will fit Types B, B-2, B-3, GA-2 and GA-3. New. D-48.

1 1 CU. YD.—Plate Front—Will fit 20-B. New. D-42.

1 1 CU. YD.—Manganese—Will fit B-2 and GA-2. Good condition. Used. D-40.

1 1 CU. YD.—Rock Type—Will fit 1030 Tunnel Shovel. New. D-50.

2 1¼ CU. YD.—Ins. Tooth—Will fit 30-B, 41-B, 42-B, E-2. New D-44.

1 1¼ CU. YD—Cast Front—Will fit 30-B, 41-B, 42-B, E-2. Used. D-43.

1 1¼ CU. YD.—Rock Type—Will fit 30-B, 41-B, 42-B, E-2. Used. D-27.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. New. D-51.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-52.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-38.

2 1½ CU. YD.—Ins. Tooth—Will fit 42-B, 43-B. New. D-55.

1 1½ CU. YD.—Ins. Tooth—Will 43-B. Used. D-39.

8 1¾ CU. YD.—Ins. Tooth—Will fit 43-B. New. D-58.

1 ⅝ CU. YD. ROCK—Will fit 20-B. New. D-64.

1 1 CU. YD. PLATE FRONT—Will fit 30-B, 41-B, 42-B, E-2. New. D-65.

1 1 CU. YD. CAST FRONT—Will fit 30-B. New. D-66.

Large Machines

1 2 CU. YD.—Manganese—Will fit 43-B. New. D-62.

2 3 CU. YD.—2½" Molybdenum cast steel front, two part Van Port reversible teeth—Will fit 100-B, 68-C, 70-C. New. D-2.

1 3½ CU. YD.—2¾" nickel chrome steel front, two part Van Port reversible teeth—Will fit 88-C, 95-C, Class 80 Atlantic. New. D-3.

1 4 CU. YD.—2¾" Molybdenum cast steel front, two part reversible teeth. In good condition.—Will fit 100-C, 120-B. Used. D-4.

2 6 CU. YD.—Molybdenum steel front. Annealed cast steel back, two-part Reversible Van Port Teeth.—Will fit 200-B, 225-B and 320-B. New. D-11.

1 8 CU. YD.—Front Molybdenum steel, two part Van Port Reversible teeth. Slightly used but excellent condition.—Will fit 320-B. Used. D-6.

LOCOMOTIVES

3 24-INCH GAUGE 3-TON BALDWIN GASOLINE LOCOMOTIVES, Model AL, Type 2. Price very favorable. L-1.

PUMPS

1 NB—3 STAGE CENTRIFUGAL PUMP—2" suction and discharge — bronze impeller and shaft—capacity 100 gallons per minute at 240' head operating at 1720 RPM or 270' head at 1780 RPM. Now equipped for belt drive but can be operated by 15 HP Electric Motor. ME-6.

BUCKETS

Dragline

5 ¾ CU. YD.—BECO TYPE "X". 2200 lbs. New. DB-21.

1 1½ CU. YD.—BECO TYPE "X". 4200 lbs. New. DB-22.

3 2 CU. YD.—PAGE CLASS "C". 5630 lbs. New. DB-4.

1 2 CU. YD.—BECO TYPE "U". 3650 lbs. Rebuilt. DB-12.

4 2 CU. YD.—BECO TYPE "U". 3650 lbs. New. DB-30.

1 2 CU. YD.—BECO TYPE "X". 5300 lbs. New. DB-23.

2 2 CU. YD.—BECO HEAVY DUTY. 5400 lbs. New. DB-24.

3 2¼ CU. YD.—BECO TYPE "U". 3850 lbs. New. DB-13.

2 2½ CU. YD.—BECO TYPE "U". 4100 lbs. New. DB-14.

1 2½ CU. YD.—BECO HEAVY DUTY. 6500 lbs. Rebuilt. DB-9.

1 2½ CU. YD.—BECO TYPE "X". 6800 lbs. New. DB-25.

1 2½ CU. YD.—OMAHA—STD. 5400 lbs. Rebuilt. DB-10.

1 5 CU. YD.—BECO HEAVY DUTY. 12700 lbs. New. DB-28.

1 5 CU. YD.—MONIGHAN HEAVY DUTY. 12000 lbs. New. DB-16.

1 6 CU. YD.—MONIGHAN TYPE "W". 12500 lbs. New. DB-17.

1 6 CU. YD.—BECO TYPE "X". 14400 lbs. New. DB-29.

1 7 CU. YD.—MONIGHAN TYPE "W". 13700 lbs. New. DB-18.

Clamshell

1 2 CU. YD. TYPE PF WILLIAMS CLAMSHELL BUCKET without teeth and counterweight. CSB-1.

ELECTRICAL EQUIPMENT

90 H.P. MOTOR—GENERAL ELECTRIC—3 phase, 25 cycle, 550 volt, 1500 RPM. NEW. EE-1.

5 KVA TRANSFORMER—GENERAL ELECTRIC—2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. NEW. EE-4.

125 KW GENERATOR—WESTINGHOUSE—250 volts, 500 amperes, Direct current. 440 RPM. Includes two outboard bearings. NEW. EE-5.

TANKS

Water

5—260 GALLON 41⅞"x21"x6'4". No. 14 BW gauge steel plate. T-1.

2—280 GALLON 36½"x20$\frac{1}{16}$"x6'3" high. Elliptical—$\frac{1}{16}$" steel plates. T-2.

1—283 GALLON 54⅜"x17⅝"x6'4". $\frac{1}{16}$" Steel plates. T-3.

Oil

15—60 GALLON 11½"x18"x77" Elliptical Blue annealed copper alloy smooth plate. T-4.

6—25 GALLON 47¼" dia. 14" deep—12 Gauge Std. Blue annealed copper alloy steel. T-5.

1—294 GALLON 48"x21¼"x6'4". $\frac{1}{16}$" steel plates. T-6.

4—50 GALLON 60" dia. x 12" deep—No. 12 Gauge Std. blue annealed copper alloy. T-7.

Gasoline

1—44 GALLON 18" dia. 43" high—No. 14 Gauge U. S. Std. welded construction. T-8.

5—55 GALLON 30"x18½"x23½" 16 Gauge—U.S.S. Terne metal. T-9.

Air

3—5 CU. FT.—16" dia. x 48" high—225 lb. working pressure A.S.M.E. Std. Tested to 340 lb. cold water test. T-10.

5—6 CU. FT.—16" dia. x 4'4" high—200 lb. working pressure A.S.M.E. Std. Tested to 350 lb. cold water test. T-11.

1—14 CU. FT.—21½" dia. x 77" high—200 lb. working pressure. Will pass inspection in Massachusetts and any Canadian Province. T-12.

2 16 CU. FT—22⅝" dia. 77" high—200 lb. working pressure A.S.M.E. Std. T-13.

ENGINES

Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

Diesel

2—140 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—5 cylinder, 9" bore x 10½" stroke, 514 R.P.M., 4 cycle, vertical overhead valves, dust proof, oil tight crank case and forced lubrication. Includes auxiliary air starting equipment. DE-2.

1—45 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINE—3 cylinder, 6" bore x 8" stroke, 650 R.P.M., 4 cycle, vertical, overhead valves and forced lubrication. DE-5.

3—110 H.P., NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—6 cylinder, 7" bore x 8½" stroke, 600 R.P.M., 4 cycle, vertical, overhead valves and forced lubrication DE-6.

Steam

1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 H.P. at 400 R.P.M. 100 lb. Pressure. ME-2.

1 4¾"x5" reversible—23.2 H.P. at 400 R.P.M. 100 lb. Pressure. ME-3.

1 5"x5" reversible—25.6 H.P. at 400 R.P.M. 100 lb. Pressure. ME-4.

BOILERS

NEW

Will Make That Old Shovel Work Like New.

Can also be used for Miscellaneous Service

Vertical Type

2 46½"x110"—32 H.P.—155 lb. Working Pressure. Special Wood Burning Fire Box. ASME Std. Will fit any B-2 or B-3. B-9.

Locomotive Type

3 44'x17'—75 H.P.—125 lb. Working Pressure. ASME Std. Will fit Model 68-C. B-13.

1 44"x18'—88 H.P.—125 lb. Working Pressure. ASME Std. Will fit Model 70-C. B-14.

1—70"x12'—136 H.P. 175 lb. working pressure. ASME, and Mass. Std. Will fit 120-B. B-18.

AIR COMPRESSORS

1 BRAND NEW WORTHINGTON—METALWELD—2-cylinder 7"x6" Vertical 162 cu. ft. piston displacement, Air Compressor. Fitted with Laidlaw feather valves—Lugs on side for mounting on skids or channels—Shaft extended and equipped with semi-flexible coupling to take 2⅝" drive shaft—Force feed lubrication. Automatic control. Includes 1" High capacity centrifugal circulating pump—"V" belt driven—18"x41" Air Receiver, 100 pounds working pressure. A.S.M.E. Standard. Electric or gasoline power required approximately 30 H.P., approximately 1000 R.P.M.—Compressor Speed approximately 550 R.P.M.—Overall dimensions: Height 45"—length 37½"—width 28". AC-3.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with with fittings. NEW. AC-1.

1 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Used. Make offer. AC-2.

EXCAVATING ENGINEER *Bargain Counter*

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1 CU. YD. 42½" WIDE—Solid type Dipper—24' Boom and all auxiliary equipment. Will dig maximum depth 22'. For application to GA-2 or GA-3 Shovel. Rebuilt—New Machine Guarantee. DS-5.

BRAND NEW PAGE, two dippers each ¾ cu. yd., one 38" wide over cutters, the other 49½" wide over cutters. 17'1½" Boom and all necessary auxiliary equipment. Will fit Bucyrus-Erie 1030 or 1035. DS-7.

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BRAND NEW Ropes included with each of above Trench Digging Equipments.

DIPPER HANDLES

1 7'6" 1030 TUNNEL—Complete. New. H-1.
1 7'10½" 20-B TUNNEL (two sticks). New. H-2.
1 9'0" 31-B TUNNEL (two sticks). New. H-3.
3 9'0" 30-B TUNNEL (two sticks each). New. H-4.
1 9'6" 20-B TUNNEL (two sticks). New. H-5.
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1 15'0" 43-B—Complete. New. H-15.
1 16'0" TYPE "A"—Complete. New. H-16.
2 16'0"—43-B—Complete. New. H-17.
1 17'0"—TYPE "A"—Complete. New. H-18.
1 17'0"—20-B HIGH LIFT—Complete. New. H-19.
1 17'0"—37-B—Complete. New. H-20.
1 17'0"—37-B—Complete. Used. H-21.
1 17'0"—43-B (two sticks). New. H-22.
1 17'0"—50-B OIL (two sticks). New. H-23.
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1 19'6"—37-B—Complete. New. H-25.

BOOMS

1—24' D-2 DRAG SHOVEL BOOM—New. JA-1.
4—18' 20-B STEAM SHOVEL BOOMS—New. JA-2.
1—18' 31-B STEAM SHOVEL BOOM—New. JA-3.
2—20'6" 20-B STEAM SHOVEL BOOM—New. JA-4.
1—21'9" 31-B STEAM SHOVEL BOOM—New. JA-5.
1—22'6" GA-2 or GA-3 SHOVEL BOOM—New. JA-6.
3—23' 20-B DIESEL, GAS OR ELECTRIC SHOVEL BOOM—New. JA-7.
1—24' GA-2 or GA-3 SHOVEL BOOM—New. JA-8.
2—24' 43-B ROPE CROWD SHOVEL BOOM—New. JA-9.
1—25'9" 30-B DIESEL SHOVEL BOOM—New. JA-10.
1—26' 20-B DIESEL SHOVEL BOOM—New. JA-11.
1—26' 30-B STEAM SHOVEL BOOM—New. JA-12.
2—26' D-2 SHOVEL BOOM—New. JA-13.
1—26' D-2 SHOVEL BOOM—Used. JA-14.
1—26' 50-B STEAM SHOVEL BOOM—New. JA-15.
3—27' 43-B ROPE CROWD SHOVEL BOOM—New. JA-16.
1—30' 50-B ELECTRIC SHOVEL BOOM—New. JA-17.
3—30' 50-B STEAM SHOVEL BOOM—New. JA-18.
1—40' 20-B, 31-B and D-2 DRAGLINE BOOM—Used. JA-20.
1—45' 30-B, E-2, 41-B and 42-B DRAGLINE BOOM—New. JA-22.

Address all inquiries to Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.

DIPPERS

Small Machines

3 ⅛ CU. YD.—Plate Front—Will fit 1020 Drag Shovel. New. D-45.

3 ⅝ CU. YD.—Plate Front—Will fit 20-B. New. D-12.

1 2/3 CU. YD.—Plate Front—Will fit 14-B. New. D-13.

2 ¾ CU. YD.—Rock Type—Will fit 20-B. New. D-15.

1 ⅞ CU. YD.—Plate Front—Will fit 1030 or 1035. New. D-18.

1 ⅞ CU. YD.—Ins. Tooth—Will fit 1030. New. D-47.

2 1 CU. YD.—Ins. Tooth—Will fit Types B, B-2, B-3, GA-2 and GA-3. New. D-43.

1 1 CU. YD.—Plate Front—Will fit 20-B. New. D-42.

1 1 CU. YD.—Manganese—Will fit B-2 and GA-2. Good condition. Used. D-40.

1 1 CU. YD.—Rock Type—Will fit 1030 Tunnel Shovel. New. D-50.

2 1¼ CU. YD.—Ins. Tooth—Will fit 30-B, 41-B, 42-B, E-2. New D-44.

1 1¼ CU. YD—Cast Front—Will fit 30-B, 41-B, 42-B, E-2. Used. D-43.

1 1¼ CU. YD.—Rock Type—Will fit 30-B, 41-B, 42-B, E-2. Used. D-27.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. New. D-51.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B, Used. D-52.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-38.

2 1½ CU. YD.—Ins. Tooth—Will fit 42-B, 43-B. New. D-55.

1 1½ CU. YD.—Ins. Tooth—Will 43-B. Used. D-39.

8 1¾ CU. YD.—Ins. Tooth—Will fit 43-B. New. D-58.

1 ⅝ CU. YD. ROCK—Will fit 20-B. New. D-64.

1 1 CU. YD. PLATE FRONT—Will fit 30-B, 41-B, 42-B, E-2. New. D-65.

1 1 CU. YD. CAST FRONT—Will fit 30-B. New. D-66.

Large Machines

1 2 CU. YD.—Manganese—Will fit 43-B. New. D-62.

2 3 CU. YD.—2½" Molybdenum cast steel front, two part Van Port reversible teeth—Will fit 100-B, 68-C, 70-C. New. D-2.

1 3½ CU. YD.—2¾" nickel chrome steel front, two part Van Port reversible teeth—Will fit 88-C, 95-C, Class 80 Atlantic. New. D-3.

1 4 CU. YD.—2¾" Molybdenum cast steel front, two part reversible teeth. In good condition.—Will fit 100-C, 120-B. Used. D-4.

2 6 CU. YD.—Molybdenum steel front. Annealed cast steel back, two-part Reversible Van Port Teeth.—Will fit 200-B, 225-B and 320-B. New. D-11.

1 8 CU. YD.—Front Molybdenum steel, two part Van Port Reversible teeth. Slightly used but excellent condition.—Will fit 320-B. Used. D-6.

LOCOMOTIVES

3 24-INCH GAUGE 3-TON BALDWIN GASOLINE LOCOMOTIVES, Model AL, Type 2. Price very favorable. L-1.

PUMPS

1 NB—3 STAGE CENTRIFUGAL PUMP—2" suction and discharge — bronze impeller and shaft—capacity 100 gallons per minute at 240' head operating at 1720 RPM or 270' head at 1780 RPM. Now equipped for belt drive but can be operated by 15 HP Electric Motor. ME-6.

BUCKETS

Dragline

5 ¾ CU. YD.—BECO TYPE "X". 2200 lbs. New. DB-21.

1 1½ CU. YD.—BECO TYPE "X". 4200 lbs. New. DB-22.

3 2 CU. YD.—PAGE CLASS "C". 5630 lbs. New. DB-4.

1 2 CU. YD.—BECO TYPE "U". 3650 lbs. Rebuilt. DB-12.

4 2 CU. YD.—BECO TYPE "U". 3650 lbs. New. DB-30.

1 2 CU. YD.—BECO TYPE "X". 5300 lbs. New. DB-23.

2 2 CU. YD.—BECO HEAVY DUTY. 5400 lbs. New. DB-24.

3 2¼ CU. YD.—BECO TYPE "U". 3850 lbs. New. DB-13.

2 2½ CU. YD.—BECO TYPE "U". 4100 lbs. New. DB-14.

1 2½ CU. YD.—BECO HEAVY DUTY. 6500 lbs. Rebuilt. DB-9.

1 2½ CU. YD.—BECO TYPE "X". 6800 lbs. New. DB-25.

1 2½ CU. YD.—OMAHA—STD. 5400 lbs. Rebuilt. DB-10.

1 5 CU. YD.—BECO HEAVY DUTY. 12700 lbs. New. DB-28.

1 5 CU. YD.—MONIGHAN HEAVY DUTY. 12000 lbs. New. DB-16.

1 6 CU. YD.—MONIGHAN TYPE "W". 12500 lbs. New. DB-17.

1 6 CU. YD.—BECO TYPE "X". 14400 lbs. New. DB-29.

1 7 CU. YD.—MONIGHAN TYPE "W". 13700 lbs. New. DB-18.

Clamshell

1 2 CU. YD. TYPE PF WILLIAMS CLAMSHELL BUCKET without teeth and counterweight. CSB-1.

ELECTRICAL EQUIPMENT

90 H.P. MOTOR—GENERAL ELECTRIC—3 phase, 25 cycle, 550 volt, 1500 RPM. NEW. EE-1.

5 KVA TRANSFORMER—GENERAL ELECTRIC—2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. NEW. EE-4.

125 KW GENERATOR—WESTINGHOUSE—250 volts, 500 amperes, Direct current. 440 RPM. Includes two outboard bearings. NEW. EE-5.

TANKS

Water

5—260 GALLON 41⅞"x21"x6'4". No. 14 BW gauge steel plate. T-1.

2—200 GALLON 36½"x20 7/16"x6'3" high. Elliptical—7/16" steel plates. T-2.

1—283 GALLON 54⅞"x17⅝"x6'4". 7/16" Steel plates. T-8.

Oil

15—60 GALLON 11½"x18"x77" Elliptical Blue annealed copper alloy smooth plate. T-4.

6—25 GALLON 47⅛" dia. 14" deep—12 Gauge Std. Blue annealed copper alloy steel. T-5.

1—294 GALLON 48"x21¼"x6'4". 7/16" steel plates. T-6.

4—50 GALLON 60" dia. x 12" deep—No. 12 Gauge Std. blue annealed copper alloy. T-7.

Gasoline

1—44 GALLON 18" dia. 43" high—No. 14 Gauge U. S. Std. welded construction. T-8.

5—55 GALLON 30"x18½"x23½" 16 Gauge—U.S.S. Terne metal. T-9.

Air

3—5 CU. FT.—16" dia. x 48" high—225 lb. working pressure A.S.M.E. Std. Tested to 340 lb. cold water test. T-10.

5—6 CU. FT.—16" dia. x 4'4" high—200 lb. working pressure A.S.M.E. Std. Tested to 350 lb. cold water test. T-11.

1—14 CU. FT.—21½" dia. x 77" high—200 lb. working pressure. Will pass inspection in Massachusetts and any Canadian Province. T-12.

2 16 CU. FT—22⅝" dia. 77" high—200 lb. working pressure A.S.M.E. Std. T-13.

ENGINES

Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

Diesel

2—140 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—5 cylinder, 9" bore x 10½" stroke, 514 R.P.M., 4 cycle, vertical overhead valves, dust proof, oil tight crank case and forced lubrication. Includes auxiliary air starting equipment. DE-2.

1—45 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINE—3 cylinder, 6" bore x 8" stroke, 650 R.P.M., 4 cycle, vertical, overhead valves and forced lubrication. DE-5.

3—110 H.P., NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—6 cylinder, 7" bore x 8½" stroke, 600 R.P.M., 4 cycle, vertical, overhead valves and forced lubrication DE-6.

Steam

1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 H.P. at 400 R.P.M. 100 lb. Pressure. ME-2.

1 4¾"x5" reversible—23.2 H.P. at 400 R.P.M. 100 lb. Pressure. ME-3.

1 5"x5" reversible—25.6 H.P. at 400 R.P.M. 100 lb. Pressure. ME-4.

BOILERS

NEW

Will Make That Old Shovel Work Like New.

Can also be used for Miscellaneous Service

Vertical Type

2 46½"x110"—32 H.P.—155 lb. Working Pressure. Special Wood Burning Fire Box. ASME Std. Will fit any B-2 or B-3. B-9.

Locomotive Type

3 44'x17'—75 H.P.—125 lb. Working Pressure. ASME Std. Will fit Model 68-C. B-13.

1 44"x18'—88 H.P.—125 lb. Working Pressure. ASME Std. Will fit Model 70-C. B-14.

1—70"x12'—136 H.P. 175 lb. working pressure. ASME, and Mass. Std. Will fit 120-B. B-18.

AIR COMPRESSORS

1 BRAND NEW WORTHINGTON—METAL-WELD—2-cylinder 7"x6" Vertical 162 cu. ft. piston displacement, Air Compressor. Fitted with Laidlaw feather valves—Lugs on side for mounting on skids or channels—Shaft extended and equipped with semi-flexible coupling to take 2⅝" drive shaft—Force feed lubrication. Automatic control. Includes 1" High capacity centrifugal circulating pump—"V" belt driven—18"x41" Air Receiver, 100 pounds working pressure. A.S.M.E. Standard. Electric or gasoline power required approximately 30 H.P., approximately 1000 R.P.M.—Compressor Speed approximately 550 R.P.M.—Overall dimensions: Height 45"—length 37½"—width 28". AC-3.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with with fittings. NEW. AC-1.

1 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Used. Make offer. AC-2.

Trade Notes

The Chain Belt Company, Milwaukee, Wisconsin, has recently announced the appointment of the **Eastern Tractor & Equipment Company**, 315 Forest Avenue, Portland, Maine, as its exclusive distributor in the state of Maine. The distributor maintains a branch at 632 Main Street, Bangor, Maine. Parts stocks and service departments are maintained at both points.

George B. Massey, consulting engineer on excavation problems in coal stripping, quarry operation, dam and waterway construction, has announced the removal of his office to 53 West Jackson Boulevard, Room 1504, Chicago, Illinois.

R. R. Davis, formerly assistant manager of the advertising department of **Westinghouse Electric & Manufacturing Company** at East Pittsburgh, Pennsylvania, will succeed Ralph Leavenworth, who has resigned as manager as of January 1, 1936, according to announcement by N. G. Symonds, Vice President.

Book Reviews

Road Maintainers—A new twelve-page illustrated booklet describing FWD Models LM and HM road maintainers has been published by the **Four Wheel Drive Auto Company**, Clintonville, Wisconsin. Action and descriptive views plus comprehensive detail show the successful use of FWD trucks equipped with underbody scrapers for road maintenance.

Industrial Head and Eye Protection —The Chicago Eye Shield Company, 2300 Warren Boulevard, Chicago, Illinois, has recently published a 20-page catalog describing industrial goggles, masks, helmets, and respirators for use on dusty work or for sand blast operators. With silicosis problems receiving wide attention, such protective devices are coming into more general use.

Pneumatic Tires—A new four-page booklet on "Pneumatic Tires for Wheelbarrows and Industrial Trucks" has just been published by **The B. F. Goodrich Company**, Akron, Ohio. The booklet gives specifications of various tires, outlines their advantages in meeting various work problems, and presents illustrations showing their successful application.

Vibrating Screens — Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, has recently published an 8-page bulletin, No. 1474-A, describing the company's line of Aero-Vibe screens. These cable-and-spring-suspended vibrating screens are illustrated in both single and double deck type, together with their multiple V-belt drives. They are stated to be applicable to most any materials sized for commercial purposes, either wet or dry, such as crushed stone and slag, sand and gravel, coal and coke, oyster shells, various ores, and many other materials.

Elevating Graders—"More dirt moved at a lower cost per yard" is the theme and claim of an attractively illustrated 40-page booklet "Power Controlled Caterpillar Elevating Graders" recently published by the **Caterpillar Tractor Company**, Peoria, Illinois. Features of both the Number 48 and the Number 42 elevating graders are brought out by photographs and drawings. Lighter draft and greater production are claimed for these elevating graders because of advanced design and weight distribution.

Electric Tools — The Independent Pneumatic Tool Company, Chicago, Ill., has published catalog No. 32 which illustrates the entire Thor line of Universal Electric Tools, with complete specifications. In addition to the regular line of tools: portable drills; screw drivers; hand and bench grinders; nut setters; saws; electric hammers; this catalog includes the new U-14 electric tool which the manufacturer states is the smallest and lightest weight portable tool ever built.

Belt Conveyors—The Jeffrey Manufacturing Company, Columbus, Ohio, has published a 16-page bulletin "Rivers of Dirt" which describes and illustrates the conveyor methods in use at Grand Coulee Dam on the Columbia River in Washington. On this job, material is being conveyed a mile in a lift of over 500 feet at the rate of 40,000 yards a day and 1,000,000 yards a month. Grand Coulee is the world's greatest conveyorized construction project. Engineers and contractors will find this booklet interesting.

Training Foremen—The growing attention being given to employer-employee relations has served to focus attention on foremen and other supervisory employees because of their key position between management and the rank and file of the organization. This explains why, according to a report recently issued by the Policyholders Service Bureau of the Metropolitan Life Insurance Company, increasing emphasis is being placed on the training of such supervisors as foremen and the other "non-commissioned officers" of managerial staffs. The report entitled "Training Supervisors and Key-Men" presents an outline of the practices of 85 companies that have inaugurated such training programs. It also discusses methods of planning programs and the costs. The details of the practices of seven companies are outlined at some length. Copies of this report are available without charge on request to the **Policyholders Service Bureau, Metropolitan Life Insurance Company, One Madison Avenue**, New York, N. Y.

Any catalog, bulletin, etc., mentioned on these pages may be had free of charge — unless otherwise noted — by writing the manufacturer. Use the handy EXCAVATING ENGINEER postcard bound in this issue.

Arc Welders—The Harnischfeger Corporation, Milwaukee, Wisconsin, has recently published a 24-page bulletin "Weld It Well" which covers the complete line of P&H-Hanson Arc Welders from 50 to 800-ampere units as well as welding fixtures and accessories. The book is well illustrated and contains condensed specifications and performance data.

National Housing Act—The Federal Housing Administration, Washington, D. C., has recently published a 24-page booklet, F.H.A.-180, entitled "Loans up to $50,000". Its purpose is to explain to all responsible business men how modernization credit for any business property improvement and re-equipment is made available to them under the National Housing Act which was amended in May, 1935, to broaden the plan of Government insurance to cover loans up to $50,000 under favorable conditions. The booklet contains a great deal of information and answers a number of questions pertaining to the subject. Among the structures and properties eligible for modernization credit loan are the following: garage and repair shops; machine shops; mines; rock quarries; sand and gravel pits.

Concrete Mixers — Koehring Company, 3026 W. Concordia Avenue, Milwaukee, Wisconsin, has for distribution a 12-page catalog entitled "Koehring Heavy Duty Construction Mixers." Well illustrated, the catalog covers the 28-S, 56-S, and 84-S mixers and describes the many features of construction developed by the manufacturer. General dimensions and specifications are tabulated for ready reference.

Insurance and Annuities—The American Institute for Economic Research, 1200 Massachusetts Avenue, Cambridge, Massachusetts, has recently published a 174-page cloth bound book entitled "Insurance and Annuities From the Buyer's Point of View" for which the price is $2.50. The authors are E. C. Harwood, who is the Director of the American Institute for Economic Research and is widely known as the author of numerous articles and three books on economics and finance, and Bion H. Francis who is in charge of the Institute's insurance and annuity research work. The purpose of this volume is to make information available to the average man who buys

life insurance and annuities. Technical words and the more complex aspects of the subject have been avoided as far as practicable, but this book will require thoughtful consideration and study by the reader. A few of the interesting subjects discussed are: The gamble on your life; Ordinary life insurance; What are you paying for?; How much insurance should a man carry?; How to choose the best companies?; The different kinds of annuities; and Retirement annuities.

Silicosis—A new book on a subject concerning one of the country's major medical industrial problems today—the dust hazard and dust disease as seen from the points of view of the doctor, lawyer, engineer, insurer, industrialist, and educator, has been compiled by Davis, Salmonsen and Earlywine in abstract form. Its title is "Review of the Pneumonokonioses (Silicosis) — Literature and Laws of 1934," and is published by the Chicago Medical Press (not Inc.), 302 S. Canal Street, Chicago, Illinois. The price of the book is $10.00.

Wire Rope—A new general catalog entitled "Macwhyte Wire Rope" is now available for distribution by the Macwhyte Company, Kenosha, Wisconsin. This 112-page catalog describes Macwhyte's entire line of wire ropes, many of which are applied to power excavators, mine hoists, quarry sand and gravel pit operations, and to blast-hole and to water-well drills. In addition to describing Macwhyte's process of manufacturing, the catalog contains sections devoted to slings, wire rope fittings, and general information.

Carbide Residue — The Linde Air Products Company, 30 East 42nd Street, New York City, has available a 20-page booklet entitled "The Utility of Carbide Residue" which explains in detail how owners of acetylene generators may capitalize on their valuable residual by-product. Carbide residue can be used as the principal ingredient in white wash, fire proof cement, mortar, plaster, concrete, or stucco. Formulas and hints for the preparation and utilization of these various covering agents and construction materials are given. Also the residue can be used as an oil and dirt scavenger, as a cleaner for drainage pipes, as a brake and clutch dressing for machinery, and as an ingredient in boiler lagging.

Federal Contracts—The Fidelity and Deposit Company of Maryland, Baltimore, Maryland, has recently made available a 64-page booklet entitled "Matters of Procedure Under Government Contracts" for the benefit of firms and individuals who enter into contracts with the Federal Government for construction work, or for the furnishing of supplies. The author of this important work, Col. O. R. McGuire, has been a Civil Service employee of the Federal Government for 18 years and now is Counsel to the Comptroller General of the United States. The information presented in this booklet enables the reader to obtain a clearer and more complete understanding of the Government's method of doing business as well as of the method of recourse open to contractors and suppliers in the event they feel that the demand made upon them by the Government or its officials are unreasonable.

Arc Welding Handbook—A revised and enlarged edition of the "Procedure Handbook of Arc Welding Design and Practice" is announced by the Lincoln Electric Company, Cleveland, Ohio. The new handbook contains 586 pages and is divided into eight principal sections each dealing with an important phase of arc welding. The text is written in a simple, concise manner and is profusely illustrated, there being over 700 illustrations consisting of detailed drawings and photographs. Written especially for the use of designers, engineers, welding supervisors and operators, the Procedure Handbook serves as a practical guide to all who are interested in arc welding. It also serves as a handy reference for estimating welding costs. The new Handbook is 5¾x9 inches, suitable for desk or shop use. It is bound in semi-flexible simulated leather embossed in gold. Copies will be mailed to any address in United States for $1.50 per copy (foreign postage fifty cents additional). *Excavating Engineer* will gladly forward your order for this handbook to the publisher upon receipt of your check, currency, or money order.

POSITIONS WANTED

Positions wanted advertisements will be run under this heading for 5 cents per word, minimum charge $1.00. Advertisements for help wanted free of charge.

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

SHOVEL OPERATOR

Five years' experience on Bucyrus-Erie Gas+Air on basement excavation, highway and street grading. Also eight years experience on Erie, Marion, Bucyrus steam shovels. Will go anywhere. Can do own repairing. A-1 reference. Sober and reliable. Present location Minnesota. Box 7501.

SHOVEL OPERATOR

Operator with 15 years' experience on quarry shovels, general grading and strip mining desires position anywhere in U. S. Has operated steam and gasoline machines; shovels, clamshells and pile drivers. Prefers steam machine, Bucyrus 20-B to 225-B. Can do own repair work. References furnished. Age 36; married. Now located in Kansas. Box 7804.

CONSTRUCTION SUPERINTENDENT

Twenty years' experience, ten of this contracting. Exceptional record for producing results; dams, sewers, hydro-power developments, mountain roads not paving, tunnels, bridges, factories; some quarry work. Graduate C. E.; fluent Spanish, some Portugese and German; 8 years in foreign countries. Would consider profit-sharing basis. References. Box 7602.

EXPERIENCED SHOVEL-CRANE OPERATOR

Twelve years' experience on steam shovels, clamshells and locomotive cranes—excavating, pile driving, steel erection work. Can do own repairing. Age 30 and single. A-1 references. Present location, New York. Box 7603.

OPERATOR

Operator with seven years' experience desires work on any type machine. Has operated draglines 4 years, shovel 2 years and crane-clamshell 1 year. Experienced on steam, electric, gas, Diesel and gas-air machines in sand and gravel pit, stripping, levee building and lock and dam construction. Can furnish excellent references. Willing to go anywhere. Age 28; married. Now located 70 miles southwest Chicago, Illinois. Box 7701.

CRANE-SHOVEL-DRAGLINE OPERATOR

Position operating any model Bucyrus-Erie, Northwest, P&H, or Koehring up to 2 yards capacity is desired by man who has had fifteen years' experience on steam and gasoline machines. Can do all repair work and erecting. Excellent references. Now located in Wisconsin. Will go anywhere in U. S. Box 7801.

QUARRY SUPERINTENDENT

Have 14 years' experience as foreman and superintendent of quarries. Age 34. Will take stock in company as part of monthly salary. Married. Willing to go anywhere. Box 7601.

OPERATOR

Experienced operator desires shovel or dragline work. Has had fourteen years' experience on shovel, dragline and clamshell in quarry, coal stripping and loading, and contracting. Prefers Bucyrus or Marion—½ to 6 yards—steam, electric or gas. Can do own repair work. Can furnish best of references. Age 39; married. Willing to go anywhere. Now located in Kansas City, Mo. Box 7702.

SUPERINTENDENT OR FOREMAN

Graduate mining engineer having 25 years' experience, greater part of which has been on coal stripping, is looking for position as superintendent or foreman on some kind of dirt moving job. Has been operating metal mines for past two years. Age 48; married. Prefers to stay in Western States but will go anywhere for right opening. Now located in Arizona. Box 7802.

LARGE MACHINE OPERATOR

Operator with 24 years' experience on all types and makes of machines desires position on large shovel or dragline. Prefers large electric stripper but will consider any permanent connection. Has worked on grading, levee building, quarrying, gravel pit, coal stripping and iron mining. Last job on 750-B coal stripper. Age 45; married. Will go anywhere. Can do own repair work. Best of references furnished. Now located in Indiana. Box 7803.

EXPERT DRAGLINE AND SHOVEL OPERATOR

16 years' experience as shovel operator. Married, 36 years of age. Have operated practically all makes of machines, and have 10 years' experience as dragline operator. Can handle steam, Diesel, electric or gasoline machine. Have worked on highway and railroad grading, rock excavation in quarry, drainage and irrigation and dredging and also gold dredging. Prefer position on Bucyrus-Erie E-2, D-2, or 50-B or other Bucyrus-Erie machines. Have also operated Class 220 and 225 electric and Diesel electric machines. Capable of taking charge of repairing and erecting and can handle crews. Best of references and can do own repairing. At present located in California, but will go anywhere. Box 5507.

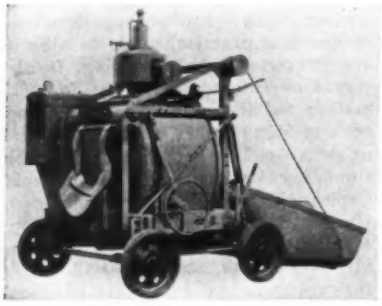
EQUIPMENT *You Ought to Know About*

(*Continued from Page 35*)

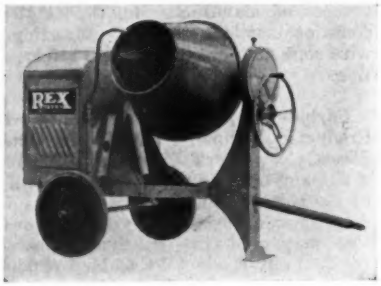
ticularly adaptable for use on Diesel and gasoline shovels, for lighting construction jobs, camps, cement laying jobs, and for furnishing current for small portable electric tools. Bulletin No. 24 describing these plants will be mailed on request.

Chain Belt Adds to Line

CHAIN BELT COMPANY, Milwaukee, Wisconsin, has struck a new note in the design and construction of its 1936 models of Rex construction equipment. The former unattractive



complexity of mixers, motomixers, and pumps has given way to attractive simplicity, enclosed gears, and a tendency toward streamlining. Not only do the 1936 refinements on Rex construction equipment offer improved appearance but the necessary addition of sheet steel and gear cases strengthen and improve the operation of this equipment.



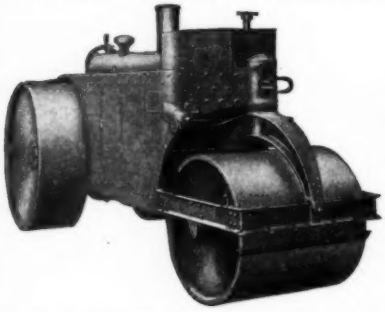
In addition, the Chain Belt Company has made distinctive advances in basic design and has added several new machines to its line: a 7-S and 10-S two-wheel end-discharge mixer; a newly designed 28-S mixer; three new models of Rex moto-mixers and agitators, and two new and improved models of Rex speed prime pumps. Existing models of Rex construction equipment have been modernized in appearance and improved in construction to meet with 1936 job standards.

The new two-wheel, high-speed trailer types—10-S and 7-S, are built for mobility and maneuverability. They are both compact and light in weight, and have all the original Rex job mixer features. The towing tongue is retractable, and the frame is reinforced by tubular cross-members which defeat the torsional strains encountered in high speed towing. All 1936 models are furnished with the new and improved Rexometer (batchmeter) as optional equipment.

Diesel-Powered Roller

DIESEL-POWERED rollers, recently announced by the Davenport-Besler Corporation of Davenport, Iowa, is additional evidence of the growing popularity of low fuel-cost Diesel power in the realm of mobile equipment.

Davenport Diesel Rollers are furnished in 10 and 12-ton units.



They are powered with Caterpillar D-6100 Diesel engines and have embodied in them such other Caterpillar standard parts as transmission gears, clutch, differential, and power take-off for steering and for operating such accessories as scarifier, grader blades, sprinkler system, ironer roller.

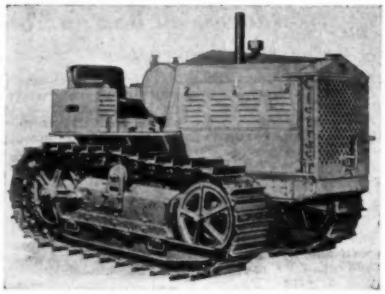
The bull driving gear is centrally located, is completely housed in the transmission case, is sealed against dust and grit, and runs in oil—a feature which, it is claimed, combines with the central application of power to the drive shaft to insure longer life.

Strictly one-man operation is claimed for these rollers which have four speeds forward and four reverse with a speed range of .92 to 5.02 miles per hour.

The wheels are of all-steel, heavy welded construction, accurately machined, round and true. All wheels are designed to receive liquid or solid ballast to permit temporary increases in weight where circumstances demand.

Cletrac Model "30"

THE Cleveland Tractor Company, Cleveland, Ohio, recently announced the Model 30 Cletrac, illustrated below, which develops 33 horsepower at the drawbar and 38 belt horsepower. The power unit is a six-cylinder, 3¾x4¼-inch engine with force-feed lubrication to the crankshaft, connecting rods, and tim-



ing gears. Six-volt starting and ignition units are standard equipment.

The new Cletrac 30 has three speeds forward: 1.75, 2.75 and 4.25 miles per hour. The drawbar pulls are respectively: 7350; 4500; 2560. Steering is by the Cletrac controlled differential.

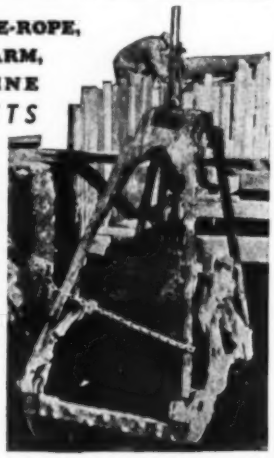
Concrete Vibrators

MASTER Vibrator Company, Dayton, Ohio, recently announced its line of Master Vibrators — a complete series of ten

MULTIPLE-ROPE, POWER-ARM, DRAGLINE BUCKETS

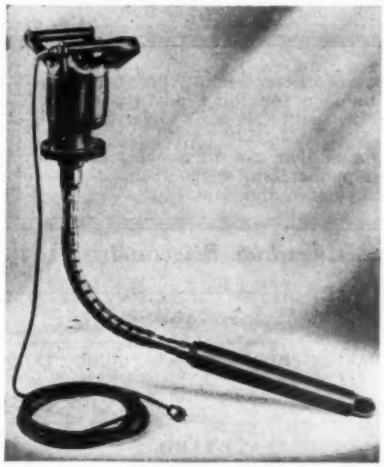
THE DIGGING DEMONS!

A comparison of output speaks loudly in favor of Williams Buckets. Write for Bulletins.



THE WELLMAN ENGINEERING CO.
7002 Central Ave., Cleveland, Ohio

WILLIAMS BUCKETS



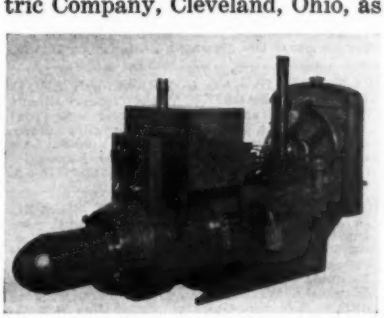
models—to suit any type of concrete work from road slabs to heavy mass concrete.

According to the announcement, Master Vibrators are the only vibrators designed and built with floating power. The motor, fields, armature and leads are almost completely protected from all vibration. The lower portion of the vibrator containing the rotating offset weight is insulated from the upper portion by a rubber seal. The drive connection from the motor has a moulded flexible rubber connection splined at both ends with the steel splines moulded into the rubber.

Master Vibrators are furnished to fit all conditions, dimensions of work, types of concrete, etc. The diameter sizes of the vibrating unit range from two and one-half up to six inches. Both the narrow section type and ball type vibrator are available. The vibrators are driven by electric motors ranging from one-half hp. up to two hp. The illustration above shows a Master Two highway-type vibrator.

Low-Priced Engine-Driven Arc Welder

A NEW 200-ampere engine-driven "Shield Arc" welder is announced by The Lincoln Electric Company, Cleveland, Ohio, as the lowest priced welder of this type ever placed on the market. This new model supplies a uniform current for welding with bare or heavily coated shielded-arc-type electrodes in all sizes up to ¼ inch.



The welder is powered by a Waukesha 4-cylinder engine which delivers 23 hp. at 1400 R.P.M. A gear-driven governor maintains proper engine speed at all load conditions.

The engine is direct connected to the generator shaft. Due to this close-coupling feature, the unit is compact and weighs only 1078 pounds. This new low-priced welder sells for $695.00 F.O.B. Cleveland, Ohio, with freight allowed to destination in the U.S.A.

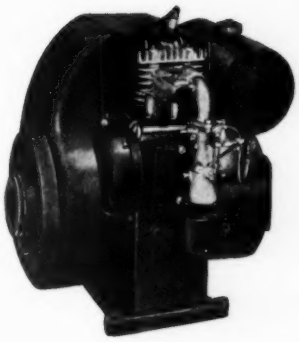
Diamond T Line for 1936

IN ANNOUNCING the new line of 1936 models which range from 1½ to 4 tons capacity, Diamond T Motor Car Company, Chicago, Ill., stresses a further development of its well-known streamline style as well as important advances in load distribution, spring suspension, vibration elimination, driver comfort and increased ease of handling. The consistently satisfactory performance record of current Diamond T engines, clutches, transmissions, axles, and brakes, it is stated, makes it not only unnecessary but distinctly inadvisable to make any important changes in these major units.

Engines have been moved forward in the frame to a position well over the front axle, which improves the riding qualities substantially, as well as providing greater payload space for a given wheelbase. It also increases the proportion of the total load carried by the front axle and effects better distribution of the total weight of the loaded truck. There is also a substantial gain in cab space available. The minimum wheelbase of Models 212A to 228 has been increased from 135⅛" to 139¾" and a 9-ft. body can now be used even on the shortest wheelbase and satisfactory weight distribution maintained.

Electric Generating Plants

D. W. ONAN & SONS, Minneapolis, Minn., have just announced for 1936, a new lightweight, 110-volt, 60-cycle alternating current generating plant suitable for construction camps and places where the user must provide his own electricity. Made in standard and light-weight types for portable use, these machines are fully enclosed, built with four-cycle engine of 1 hp. and operating at 1800 R.P.M. The engine has magneto ignition, float feed carburetor, governor, pressure lubrication through the crankshaft to connecting rod.



This plant is furnished complete, ready to run. Has a capacity of 350 watts, sufficient for ten to twelve lights, radio or small appliances. Other Onan A.C. generating plants are offered in sizes up to 3000 watts capacity. There are ten distinct sizes and fifteen models.

BUCYRUS-ARMSTRONG drilling and fishing tools are backed by over 65 years of experience in the field, are of exceptional value because of accurate workmanship and great care given to the selection and treatment of materials. There is no extra charge for the high quality of Bucyrus-Armstrong tools. You will find them fully described, illustrated and conveniently priced in the 48-page Bucyrus-Armstrong tool catalog. *Send for it, today.* 1881

BUCYRUS-ERIE

EXCAVATING, DRILLING & MATERIAL-HANDLING EQUIPMENT • • SOUTH MILWAUKEE, WIS.

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Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

Small Shovels
Under 2 Yards

⅜-YARD

BYERS-BEARCAT — Combination Shovel—Pull Shovel and Lifting Crane; Half swing. Gasoline power. Excellent condition. Located Detroit, Michigan. Box 690-SS.

INSLEY TYPE C SKIMMER SCOOP—¾ swing. Buda 4 cylinder Model KTU Gasoline Engine. Bargain Price. Located near Atlanta, Georgia. Box 773-SS.

2 INSLEY ⅜ YARD GASOLINE SHOVELS. Located eastern New York State. Bargain prices. Box 574-SS.

INSLEY ⅜ YARD GASOLINE COMBINATION SHOVEL AND BACK HOE. Half swing. Steel Cab. Good condition. Located Central Pennsylvania. Box 735-SS.

UNIVERSAL—UNIT MODEL 310—⅜ CUBIC YARD ¾ SWING GASOLINE SHOVEL. Caterpillar mounted. Good operating condition. Located Wisconsin. Box 763-SS.

UNIVERSAL-UNIT ¾-swing combination ⅜ cu. yd. gasoline shovel and 30-foot boom dragline, including ⅜ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SS.

⅜ YARD SHOVEL
Universal ⅜ yard gasoline shovel—¾ swing. Good operating condition. Located Northern Michigan. Box 636-SS

½-YARD

BROWNHOIST MODEL NO. 2 ½ cu. yd. rope crowd gasoline shovel or clamshell. Waukesha four cylinder engine in good operating condition. Bargain price. Located near Peoria, Illinois. Box 689-SS.

GENERAL COMBINATION SHOVEL-CRANE. Shovel Boom and Handle rebuilt. A-1 shape. ⅝ yard Dipper. 35' Crane Boom. 12 New Cat Tread Links. Cat mounting and general condition machine—good. Located Georgia. Price very reasonable. Box 578-SS.

GENERAL ½ cubic yard Gasoline Shovel—including 30' Boom Clamshell and Dragline Equipment—New 1931—powered with Buda DW6 High Altitude Gasoline Engine. Excellent condition. Located near Denver. Box 588-SS.

UNIVERSAL—MODEL NO. 35—½ cu. yd. shovel and 28' boom clamshell including ½ cu. yd. Owens clamshell bucket. Powered by Waukesha four cylinder 4½" x 6¼" gasoline engine. Engine completely overhauled this year. Entire machine put in first class shape. Excellent condition. Located North Carolina. Box 696-SS.

⅝-YARD

MEAD MORRISON—⅝ CUBIC YARD GASOLINE SHOVEL. Good operating condition. Located near Boston. Box 706-SS.

P&H MODEL 300 SHOVEL—18' Boom, 15' Dipper Handle, ⅝ cubic yard Dipper, manganese front. Powered with Waukesha B U 4½"x6¼" engine, power clutch control. First class operating condition. Located Massachusetts. Box 663-SS.

¾-YARD

BUCYRUS-ERIE TYPE B STEAM COMBINATION SHOVEL-CLAMSHELL AND STEAM HOE. Machine completely rebuilt 1929. Good operating condition. Located near Boston. Box 517-SS.

BUCYRUS-ERIE TYPE B HIGH LIFT STEAM SHOVEL. Caterpillar mounted. Good operating condition. Located New Haven, Connecticut. Box 776-SS.

BUCYRUS-ERIE TYPE B CATERPILLAR MOUNTED, HIGH LIFT STEAM SHOVEL. Good operating condition. Located Connecticut. Box 775-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, cat. mounted, equipped with 19'6" boom 16' dipper stick and ¾ yard dipper including 36' clamshell boom in good working order. Located near Hudson, Pennsylvania. Price $1000.00. Box 493-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat mounted, 19'6" boom, 14' dipper handle, ¾ cubic yard dipper. also 36' clamshell boom and front drum and gearing. Located Kansas City, Missouri. Box 622-SS.

1—Type B Bucyrus-Erie Combination High Lift Shovel and 40' Clamshell Machine.
1—Type B Bucyrus-Erie High Lift Shovel.
2—Type B-2 Bucyrus-Erie High Lift Shovels.
All located western Connecticut. Operating condition. Entire lot very low price. Box 573-SS.

BUCYRUS-ERIE 20-B COMBINATION STEAM SHOVEL - CLAMSHELL - DRAGLINE. Good working condition. Caterpillar Mounted. Located near Peoria, Illinois. Box 701-SS.

BUCYRUS-ERIE TYPE B STANDARD ¾ YARD STEAM SHOVEL—Quarry type Dipper—Caterpillar mounted. Good operating condition. Located Georgia. Box 752-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wis.

TYPE B BUCYRUS-ERIE HIGH LIFT STEAM SHOVEL. 21'3" Boom, 18'4" Dipper Handle, ¾ cubic yard inserted Tooth Dipper—Power Boom Hoist—Boiler Feed Pump—Caterpillar Mounted. Located Chicago. Box 699-SS.

KOEHRING MODEL 301 COMBINATION SHOVEL & 40' BOOM DRAGLINE, caterpillar mounted Gasoline Power. Good operating condition. Located Indiana. Box 764-SS.

MARION MODEL 21 ELECTRIC—M.G. SET ¾ YARD SHOVEL. Good condition. Located eastern Pennsylvania. Box 725-SS.

OSGOOD MODEL 18 Steam—¾ yard shovel—Cat mounted. Just completely overhauled. Excellent condition. Located near Indianapolis, Ind. Box 522-SS.

⅞-YARD

MARION MODEL 21—⅞ CUBIC YARD STEAM SHOVEL. Caterpillar Mounted. Good working condition. Located Georgia. Box 758-SS.

1-YARD

BAY CITY MODEL "S". 21' Boom, 16' Dipper Handle, 1¼ cubic yard Dipper Climax Blue Streak four cylinder 6"x7" Gasoline Engine. Electric Starter. Excellent condition. Located Boston. Box 757-SS.

BUCYRUS-ERIE LATE MODEL B-2 STEAM HIGH LIFT SHOVEL. 1 yard dipper—single shaft cat mounting. Good condition. Located near St. Louis. Box 518-SS.

BUCYRUS-ERIE GA-2 GAS-AIR COMBINATION ONE YARD SHOVEL AND 45' BOOM CLAMSHELL AND DRAGLINE not including Buckets Recently reconditioned. Located Indianapolis. Box 766-SS.

BUCYRUS-ERIE—GA-2 GAS-AIR SHOVEL. Extra High Lift. Caterpillar mounted. Good operating condition Waukesha 5¾"x8" four cylinder gasoline Engine. Air Starter. Located Chicago. Box 754-SS.

1 BUCYRUS-ERIE B-2 Steam ⅞ yard High Lift Shovel—Cat Mounted. Good operating condition. Located near Boston. Make offer. Box 521-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wisconsin

BUCYRUS-ERIE GA-2 Gas-Air High Lift Shovel. 24' Boom, 18'4" Dipper Handle, 1 cubic yard Dipper. Single shaft cat. Waukesha four cylinder gasoline engine. Excellent operating condition. Located North of Chicago. Box 645-SS.

BUCYRUS-ERIE B-2 Steam Combination Shovel and Clamshell Machine. Single shaft cat mounted. ⅝ cubic yard Williams Clamshell Bucket included. Excellent mechanical condition. Located Virginia. Box 672-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'9" Boom, 16' Dipper Handle, ⅞ cubic yard inserted tooth Dipper. Two speed propelling gear. Located Boston. Box 716-SS.

BUCYRUS-ERIE B-2 EXTRA HIGH LIFT STEAM SHOVEL. 21'3" Boom, 16' Dipper Handle, ⅞ cubic yard inserted tooth Dipper. Single Shaft Cat. Located Boston. Box 717-SS.

BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND DRAGLINE. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. 50' Dragline Boom including Fair leads but not Bucket. Air Starter. Good condition. Located Newark. Box 718-SS.

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 24' Boom—18'4" Dipper Handle, 1 cubic yard Inserted Tooth Dipper. Also includes Forward Drum and Gearing and mechanism for clamshell operation including 45' boom. Also 1 cubic yard Williams clamshell bucket. Waukesha WL Engine. Good operating condition. Located Chicago. Box 702-SS.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

BUCYRUS-ERIE B-2 STEAM SHOVEL, Cat Mounted. 19'9" boom, 16' dipper handle, 1 cubic yard dipper. Good running condition. Located, Minnesota. Box 621-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Very good working condition. Located South Carolina. Box 644-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Good working condition. Located northern New Jersey. Price very reasonable. Box 643-SS.

BUCYRUS-ERIE GA-2—Gas-Air Combination High Lift Shovel and 50' Boom Dragline Equipment, mounted on Single Shaft Cat. Good operating condition. Located at Fort Smith, Ark. Box 537-SS.

B-2 EXTRA HIGH LIFT STEAM SHOVEL. 24' Boom—18'4" Dipper Handle—¾ yard Inserted Tooth Dipper—Boom Hoist—Caterpillar Mounted—Good operating condition. Located Chicago. Box 700-SS.

LORAIN—MODEL 60—One cubic yard Gasoline Shovel. Good condition. Located Chicago. Box 677-SS.

FOR SALE CHEAP

Marion Model 440 Gas Shovel and Dragline, 1 cubic yard capacity. For sale cheap. Located Missouri. Box 634-SS

MARION 1 CUBIC YARD STEAM SHOVEL. Bargain Price. Box 777-SS.

MARION 1 YARD STEAM SHOVEL Box 575-SS.

NORTHWEST MODEL 105—1 YARD GASOLINE SHOVEL. Fair running order. Located Georgia. Bargain price. Box 579-SS.

NORTHWEST NO. 4—24' Boom, 16' Dipper Handle, 1 yard Dipper—Gasoline—Located eastern New York. Good condition. Box 600-SS.

P & H MODEL 600 -1 yd. Gasoline Shovel—including 40' boom dragline equipment without bucket. Waukesha Engine. Recently overhauled. Located in Alabama. Box 483-SS.

P&H MODEL 600—1¼ CUBIC YARD GASOLINE SHOVEL. Will be put in good operating condition. Located eastern Pennsylvania. Box 664-SS.

P&H—MODEL 600—Combination 1 yard shovel and 40' boom dragline including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SS.

1¼-YARD

BUCYRUS-ERIE GA-2 Gas-Air Extra High Lift Shovel—24' Boom, 18'4" Dipper Handle, 1¼ cu. yd. Dipper, Single Shaft Cat. Electric Starter. Excellent condition. Located eastern Pennsylvania. 592-SS.

BUCYRUS-ERIE GA-3—1¼ CU. YD. HIGH LIFT SHOVEL, Waukesha 6¾"x8" 6 cyl. gasoline engine. Excellent condition. Favorable price. Located in Montana. Box 780-SS.

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL—24' boom, 16' dipper handle, 1¼ cubic yard dipper, on single shaft cat. Electric starter, Waukesha 4-cylinder 6¼"x8" gasoline engine. Reported excellent condition. Located Virginia. Box 623-SS.

BUCYRUS-ERIE 41-B STEAM SHOVEL—21' Boom, 15' Dipper Handle, 1¼ cu. yd. Dipper, Power Boom Hoist, Cat mounted. Located New York City. Box 545-SS.

BUCYRUS-ERIE — DIESEL-AIR — COMBINATION SHOVEL AND DRAGLINE. 22'6" Boom—16' Dipper Handle—1¼ cubic yard Inserted Tooth Dipper. 45' Boom Complete Dragline Equipment without bucket. Engine—Atlas Diesel. Located Oklahoma. Good operating condition. Box 703-SS.

BUCYRUS-ERIE GAS-AIR TYPE GA-2 HIGH LIFT SHOVEL—22'6" boom—16' dipper handle—1¼ yard cast front inserted tooth dipper—single shaft caterpillar mounting—electric starter. Excellent condition. Field reconditioned. Waukesha 4-cylinder 6¼'x8" engine — New cylinder blocks and piston rings. Located near Scranton, Pennsylvania. Will demonstrate. Box 508-SS.

BUCYRUS ERIE GA-2 Gas-Air High Lift Shovel—24' Boom, 16' Dipper Handle, 1¼ cu. yd. Dipper, Single Shaft Cat, Electric Starter. Waukesha 4-cylinder 6¼"x8" Gasoline Engine. Reported excellent condition. Located West Virginia. 593-SS.

BUCYRUS-ERIE GAS+AIR—22' Boom, 16' Dipper Handle, 1¼ cubic yard Dipper, Waukesha 6¼"x8" four cylinder gasoline engine. Single Shaft Cat mounted. First class condition. Located eastern New York. Box 601-SS.

BUCYRUS-ERIE 41-B STEAM SHOVEL. 21' Boom, 15' Dipper Handle, 1¼ cubic yard Dipper. First class operating condition. Located New York. Box 719-SS.

BYERS MASTER SHOVEL — 26' Boom, 17' Dipper Handle, 1¼ cu. yd. Dipper, New January 1931. Good working condition. Located near Kansas City. Price very favorable. Box 591-SS.

LIMA MODEL 101—Combination 1¼ yard shovel and 40' plus 10' extension Dragline—powered with gasoline engine Model JK 6¼" x7"—4 cylinder. Shovel equipment practically new. Located Colorado. Box 599-SS.

LINK-BELT MODEL K-42 1¼ YARD GASOLINE SHOVEL. Waukesha Model WL 6¼"x 8" 4-cylinder Engine—new blocks and pistons this year. Good working condition. Located Colorado. Box 738-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wisconsin

LORAIN—75-A—One and one-quarter cubic yard Gasoline Shovel. Good condition. Located Chicago. Box 676-SS.

LORAIN MODEL 75 GASOLINE COMBINATION SHOVEL AND DRAGLINE. 1¼ cubic yard Shovel Dipper and 1¼ cubic yard Dragline Bucket included. New in 1929. Good working condition. Located near Denver, Colorado.

Ray Corson Machinery Company
1646 Wazee Street
Denver, Colorado

THEW LORAIN MODEL 75 SHOVEL. 24' Boom, 18' dipper handle, 1¼ cubic yard dipper. Gasoline. Machine now operating. Located central New York State. Box 665-SS.

MARION MODEL 450—1¼ Cu. Yd. Steam Shovel, Cat Mounted. New Gears on Caterpillar recently installed. Price favorable. 536-SS.

MARION TYPE 32 STEAMER. Shop No. 5676, 18' boom, 15' dipper handle, 1¼-cu. yd. dipper shipped May, 1926, good operating condition. Box 451-SS.

NORTHWEST MODEL 105 SHOVEL. Bargain Price. Located Texas. Box No. 566-SS.

P&H MODEL 650—23' Boom, 16' Dipper Handle, 1¼ cubic yard Dipper. Waukesha W.L. 4 cylinder 6½"x8" Gasoline Engine. Good condition. Now working. Available January 1 to 15, 1936. Located western Wisconsin. Box 779-SS.

1½-YARD

BUCYRUS-ERIE 37-B GASOLINE 1½ YARD CHAIN CROWD SHOVEL. Electric Starter. Excellent condition. Used only eight months. Located Connecticut. Box 732-SS.

BUCYRUS-ERIE 35-B ELECTRIC 24' BOOM, 16' Dipper Handle, 1½ cu. yd. Dipper, 3 phase, 25 cycle, 440 volt, Cat mounted. Box 544-SS.

BUCYRUS-ERIE 43-B GASOLINE CHAIN CROWD SHOVEL — 23' boom — 17' dipper handle—1½ cubic yard Vanderhoef dipper and teeth—electric starter—standard single shaft cat. Operated less than six months. Excellent appearance and condition. Will be demonstrated by owner. Located vicinity New York. No. 512-SS.

LORAIN 75-B COMBINATION SHOVEL AND DRAGLINE. 1¼ cubic yard Shovel Equipment. 50' Dragline Boom, without bucket. Waukesha 6¾"x8" four cylinder gasoline engine. Excellent condition. Located eastern Pennsylvania. Box 720-SS.

TWO LORAIN 75-B COMBINATION 1½ CUBIC YARD SHOVEL AND 50' BOOM DRAGLINES — without buckets. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 721-SS.

LORAIN 75-B 1½ CUBIC YARD SHOVEL. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 722-SS.

OSGOOD "VICTOR" 1½ CUBIC YARD SHOVEL AND 50' BOOM CLAMSHELL MACHINE. Gasoline Power. Good operating condition. Located Wisconsin. Box 760-SS.

P&H MODEL 700—1½ cubic yard shovel. Powered with Waukesha 150 h.p. Ricardo head 7½"x8" gasoline engine. Good operating condition. Located New Mexico. Box 652-SS.

1¾-YARD

BUCYRUS-ERIE 43-B GAS SHOVEL—22' boom, 16' dipper handle, 1¾ yard inserted-tooth dipper. Electric starter, Wisconsin 6 cylinder 6x7" engine. Reconditioned—first class condition. Located New York. Box 617-SS.

Small Draglines
Under 2 Yards

⅜-YARD

TWO ⅜-YARD SARGENT SCOUT DRAGLINES. Powered with McCormick-Deering Model 200 4-cylinder 4½x5 heavy duty gas engines. Cable speed 160 fpm, single line. Two traveling speeds. Capacity as crane from 8000 lbs. at 8 ft. radius to 2800 lbs. at 24 ft. radius. First class mechanical condition. Located Iowa and Minnesota. Box 772-SD.

UNIVERSAL-UNIT ⅝ swing combination 30-foot boom gasoline dragline and ⅜ cu. yd. shovel. ⅜ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SD.

½-YARD

P&H MODEL 206 GASOLINE DRAGLINE—38' Boom. 4 cylinder Waukesha Gasoline Engine. Located eastern Pennsylvania. Fair condition. Bargain Price. Box 774-SD.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM DRAGLINE - CLAMSHELL - SHOVEL. Good working condition. Caterpillar Mounted. Located near Peoria, Illinois. Box 701-SD.

KOEHRING MODEL 301 COMBINATION 40' BOOM DRAGLINE & SHOVEL, caterpillar mounted. Gasoline Power. Good operating condition. Located Indiana. Box 764-SD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

Small Draglines
Under 2 Yards
Continued

1-YARD

BUCYRUS-ERIE GA-2 COMBINATION DRAGLINE AND SHOVEL. 50' Dragline Boom including Fairlead but not Bucket. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. Air Starter. Good condition. Located Newark. Box 718-SD.

BUCYRUS-ERIE GAS-AIR GA-2 COMBINATION 45' BOOM CLAMSHELL AND DRAGLINE. Including ¾ yard Owen Clamshell Bucket and 1 cubic yard Class "C" Page Drag Bucket and necessary equipment for operating either. Massachusetts air tanks. Favorable price. Located Connecticut. Box 778-SD.

BUCYRUS-ERIE GA-2 GAS-AIR COMBINATION 45' BOOM DRAGLINE AND CLAMSHELL AND ONE YARD SHOVEL. Buckets not included. Recently reconditioned. Located Indianapolis. Box 766-SD.

LINK-BELT 1 CUBIC YARD CAPACITY 50' BOOM DRAGLINE WITHOUT BUCKET. Gasoline power. Reported good operating condition. Located near Chicago. Box 724-SD.

P&H—MODEL 600—Combination 40' boom dragline and 1 yard shovel including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Geor... Box 695-SD.

1¼-YARD

BUCYRUS-ERIE — DIESEL-AIR — COMBINATION DRAGLINE AND SHOVEL. 22'6" Boom—16' Dipper Handle—1¼ cubic yard Inserted Tooth Dipper. 45' Boom—Complete Dragline Equipment without bucket. Engine—Atlas Diesel. Located Oklahoma. Good operating condition. Box 703-SD.

OSGOOD GASOLINE MODEL NO. 4 50-FOOT BOOM 1¼ YARD DRAGLINE including Bucket. Engine Wisconsin D-4 6-cylinder. Excellent condition. Located central Pennsylvania. Box 733-SD.

1½-YARD

LINK-BELT MODEL K-44 45' BOOM PLUS TWO 10' AND ONE 5' EXTENSIONS—TOTAL 70' DRAGLINE WITHOUT BUCKET. Gasoline power. Includes 800 Watt Kohler Light Plant. Located near Chicago. Good operating condition. Box 723-SD.

2 LORAIN 75-B COMBINATION DRAGLINES AND SHOVELS. 50' dragline booms without buckets. 1½ cubic yard shovel equipment. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 721-SD.

LORAIN 75-B COMBINATION DRAGLINE AND SHOVEL. 50' Dragline Boom without Bucket. 1¼ cubic yard Shovel Equipment. Waukesha 6¾x8" four cylinder gasoline engine. Excellent condition. Located eastern Pennsylvania. Box 720-SD.

TWO P&H 700 DRAGLINES. 1½ cu. yd. buckets on 50' booms. Gas and Diesel. Located Lower Rio Grande Valley, Texas. Box 618-SD.

1¾-YARD

BUCYRUS-ERIE — 43-B GASOLINE — COMBINATION DRAGLINE AND CLAMSHELL— 1¾ cubic yard Bucket capacity—no bucket. Good condition. Located Arizona. Box 704-SD.

2-YARD

BUCYRUS-ERIE 46-B DRAGLINE. 65' Boom with 10' removable insert. 1¾ cubic yard Omaha and 2 cubic yard U drag buckets included. Engine LeRoi RXS 6 cylinder 6½"x 7" gasoline. Kohler 1½ KW Light Plant installed. Excellent mechanical condition. Located Indiana. Box 755-SD.

Small Clamshells and Cranes
Under 2 Yards

⅜-YARD

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½-YARD

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¾-YARD

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1-YARD

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1¾-YARD

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2 Yards and Over

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Excavating Engineer
South Milwaukee, Wis.

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Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

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LOCOMOTIVES

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ONE COMPLETE 52-B DIESEL SHOVEL FRONT END. Consists of boom, dipper handle and 2¼ cu. yd. dipper.
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January Advertisers

Allis-Chalmers Mfg. Co., Tractor Division ..... 36 and 37
American Road Builders' Association 49
Austin Western Road Machinery Co., The 51
Bargain Counter ..... 62 and 63
Bucyrus-Armstrong ..... 59 and 67
Bucyrus-Erie Company ..... 6, 45, 57, and 3rd Cover
Bucyrus-Monighan 1
Caterpillar Tractor Company ..... 2nd Cover
Dietz Co., R. E. 58
Ensign-Bickford Company, The 47
Firestone Tire & Rubber Company ..... 8 and 9
For Sale Advertisements ..... 68 to 71
(See also pages 62 and 63)
Gatke Corporation 58
Hayward Company, The 54
Hercules Powder Company 5
Ingersoll-Rand Company ..... 40 and 41
Jahn Company, C. R. 60
Koenig Labor Agencies, The 74
Leschen and Sons Rope Company, A. 55
Pit and Quarry Publications 54
Positions Wanted Advertisements 65
Roebling's Sons Co., John A. 2
Sauerman Bros., Inc. 56
Socony-Vacuum Oil Co., Inc. ..... Opposite 4 and 5
Sullivan Machinery Company ..... 4th Cover
Twin Disc Clutch Co. 4
Wellman Eng. Co., The 66

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